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THE RAISING OF DAIRY HEIFERS.*

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Considering the great shortage of dairy cows, consequent on the unparalleled drought last year, with its attendant misery and death of cattle, the subject under discussion makes a strong appeal to all stock raisers. The price of meat to the consumer for the next few years will be mainly influenced by the number of calves reared at the present time. Our flocks and herds are depleted, importation on a large scale is out of the question, and only one thing remains to be done—the reservation of desirable females for breeding purposes. While the object of this paper deals with the subject from the stand-point of the dairyman, and only advocates rearing the best calves, the grazier has a problem to solve in securing cattle to supply the meat markets, and it will be to his interest to see as many calves reared as possible.

Many calves can be reared in the Western and Gippsland Districts at a very cheap rate, owing to the abundant supply of skim milk. In the past, I am doubtful if it paid to rear steer-calves on the dairy farm; but, for the next few years, the prices will be high, and the rearing of calves will considerably augment the farmer's income. This applies more especially to the farmers who hitherto failed to take advantage of that much-neglected food, skim milk.

The large amount of skim milk always available appears to disparage its value, but no other food has the same properties for building bone and muscle. The time is not far distant when its full value will be realized, and the farmer will then look back to the time when he doubted its value at 1d. per gallon, and sometimes poured it down the drain. Many are the cases when farmers, returning from the creameries, emptied their cans on the roadside. If it had been systematically applied to their own land, the loss would have been lessened, as some of its manurial

* In writing this article I am indebted to Mr. E. Steer, Herdsman at the Research Farm, for many valuable suggestions.

proporties, especially phosphoric acid, would have been returned to the soil; but such wanton waste is unpardonable.

The rearing of calves may appear to be a very simple matter, but it is only when one has to deal with the animal in its mature form that the folly and neglect of its early treatment becomes apparent.

Many different methods of feeding and treatment are practised. The system followed by our beef-breeders would spell ruin to the dairy farmer; likewise, the ordinary dairy-fed calf is not the most profitable for the grazier.

As to what is the best method of rearing our dairy heifers, is a contentious question, as many conflicting systems sometimes appear to succeed. Ever since our dairy cattle were domesticated, the whole aim has been to mould the dairy heifer into the ideal dairy cow. The question arises, "What is an ideal dairy cow?" In the first place, I would say an animal with the ability to economically consume a large amount of fodder; secondly, soundness of constitution, and early maturity; and lastly, an even-tempered, kindly disposition. These important factors, combined with proper management, form the start for maximum production, which should be the dairyman's ambition.

The attainment of maximum production can only be achieved by careful feeding, kindly handling, and a general knowledge of the young animal's requirements. It does not seem reasonable to assume that soundness of constitution, robustness, and fair bodily size, can come as the result of underfeeding, although many dairy farmers think they can. This fact is apparent to any one who visits many of our dairy farms—the weakly-constitutioned, stunted cows one sees suffer in the battle for existence, and cannot withstand many years of profitable milk flow. When the young animal's health is impaired, as the result of scanty and careless feeding, and dirty surroundings, it becomes susceptible to many of the diseases that stock is heir to; its usefulness as a dairy cow is diminished, and its market value reduced.

Many of our breeders who aim at prizes in the show-ring, often practise a system of scanty feeding to secure fineness of bone. These men are generally martyrs to type, and do not work in the interests of the producing powers of the breed, as by their methods they are retarding the development of their cattle.

On the other hand, too plenteous feeding of concentrated rations is not advisable; it develops in the young animal the tendency to make flesh and attain coarseness, and animals so fed are often deficient in barrel development, which is so essential in a dairy cow.

When a bulky ration is fed, the barrel development is much greater, and enables the heifer at maturity to consume a large amount of fodder. Generally, the largest consumers are the most profitable producers. The feeding of bulky foods develops the digestive organs, and enables the animal to assimilate a large amount of food.

There is a medium between the methods of the beef-raiser and those who practise a starvation policy, and by its adoption, the heifer is kept in a good growing condition until it is proven in calf, when it can be fed a more nutritive ration to build up a reserve in the animal's body to withstand a long milking period, and nourish the unborn calf. The first lactation period is of the utmost importance, and on the treatment given at that time depends, to a great extent, the young animal's usefulness as a profitable dairy cow.

There is a considerable variation in the natural conformation of cattle of any particular breed. One type may belong to the beef cattle, and another be the ideal of the show-yard fancier; a third may be controlled by the richness of the pastures. For instance, Jerseys bred and reared on the best Western and Gippsland farms, almost attain the size of shorthorns. While they would not win a prize in the show-yard in competition with the fine-boned type, their milking qualities are not impaired, but rather increased, and they possess a much stronger constitution.

The sooner the farmers of the State pay more attention to the productive qualities of their cattle, the sooner will their returns increase, provided cattle are pure bred, and have inherent milking ability. On appearance, some of the very best cows in the State to-day would be classed as beefers; but any good dairy cow should put on flesh when not producing, as the food usually needed to make milk and butter is then building up nature's storehouse to draw upon during the lactation period.

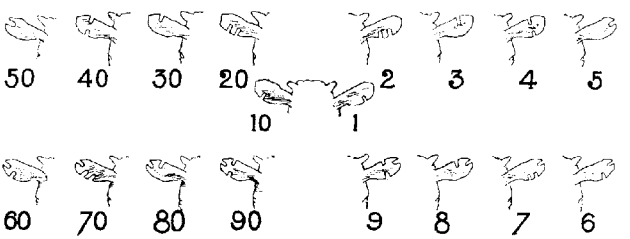
A Group of Calves at Louisiana Experiment Station. Trough and Bail Feeding.

The Department of Agriculture, through its Pure-bred Herd Testing Scheme, is doing good work for the farmer, if he only realized it. Published lists of the performances of many of our pure herds should give him a good idea where to purchase a sire. These sires can be purchased at a very reasonable price from the breeders, and there is no excuse for a dairyman to be using a bull from an untested cow. A few extra pounds spent in the purchase of the right bull is a good investment, when we consider the increased value of his progeny. A dozen heifers a year for three years, at an increased value of only £1 per head, would mean £36. But the majority of our farmers would be astounded if asked to give that price for a bull. They seem content to rely on the progeny of mongrel sires, valued by the number of cows they put in calf.

When crossbred sires are used, undesirable traits are very frequent, and the progeny is not uniform in quality. Hence, the returns of many of our milking herds are disappointingly low. Breeding for the dairy is a comprehensive study, and needs all the forethought that an intelligent farmer can apply to it.

Before dealing with the treatment of the young calf, we will presume that a desirable sire of sound constitution has been used, and that he is not introducing the germs of contagious abortion into the herd. The first principle to be observed is: that the progeny is first fed through the mother, and that any shortage of feeding at the period of pregnancy affects the unborn calf. Any sudden change of feed to the cow at this stage is also unwise.

Examine all young calves for deformities, and remove rudimentary teats from the heifers, dehorn all cross-bred stock—this should be done during the first week by clipping the hair from the horn bud, and applying caustic potash. In the case of male calves, see that their testicles are well developed. Never use a bull with one testicle, as such a fault is generally hereditary.



System of Number Ear-marking.

The young calf needs some identifying brand at an early date, in case of confusion as to dam, and the accompanying system of ear-marking is very effective.

The calf should be taken from its mother within twenty-four hours after birth, and allowed to remain another twelve hours before any attempt at feeding is made—the calf is then hungry, and will more readily adapt itself to the will of the feeder. Always feed the mother's milk for a few days—it contains medicinal properties of benefit to the young animal. The change from whole to skim milk should be gradual—any sudden change from one food to another causes stomach trouble.

Generally, if the correct methods are adopted, the calf will feed itself within a fortnight. Any one attempting to feed calves must work on a system, and be possessed of patience, to achieve success. A calf cannot be forced to drink. Women make better calf feeders than men; they seem to have more patience, and use more kindly treatment. In open-trough feeding, unnecessary violence is often vented on the calves in preventing the quickest drinker from obtaining too great a quantity, and it is no uncommon sight to see a heavy stick used for the purpose, sometimes inflicting permanent injuries. A piece of ordinary rubber hose pipe is just as effective, and does no harm. The bail system of

feeding is the ideal method, the calves receiving their correct allowance without any bustle or hurry, and the usual practice of sucking ears is prevented. The bails can be erected very economically, and half kerosene tins used as feeding vessels; but the tins need washing every day, just as well as the other dairy utensils.

Many failures are found in rearing calves; but skim milk in itself cannot be blamed, as it is a food specially endowed by nature for rearing heifers. The portion (fat) removed by the separator is not absolutely essential, and can be replaced by a less costly substitute. When trouble occurs, it is generally the result of non-observance of the following rules:—"Absolute cleanliness," "Regularity in time and quantity of feeding," and "Temperature," which should be 101 to 102 degrees Fahrenheit (body heat), and never under 80 degrees Fahrenheit —this applies to all calves under four months old.

As to the quantity to feed the calf, the feeder will be guided by the ability of the calf to utilize a given amount; but never overfeed. Many deaths occur as the result of too much freshly-separated skim milk.

Herkes's Patent Movable Bail Feeding Arrangement for Calves.

Herke's Patent Movable Bail Feeding Arrangement for Calves.

Most of the calf meals on the market are suitable as substitutes for the fat removed by the separator. Linseed, pollard, and cod liver oil are also good. Linseed is probably one of the best, and when soaked with water and boiled, becomes a jelly, a cupful of which, given to the calf twice daily in the milk, goes a long way in keeping it thriving.

Some difficulty will be found in giving calves cod liver oil, as it is an acquired taste—this applies to some of the other calf foods as well. The mechanical calf feeders on the market are effective in themselves, but the danger lies in keeping them in a sanitary condition, as filth germs are the greatest source of trouble in calf rearing. Scours are the general outcome of neglect in this respect.

Milk that passes through closed pipes, which do not permit of efficient cleansing, becomes contaminated. The all too common use of milk unfitted for market purposes as food for calves, should be avoided. I refer in particular to cows suffering from sickness, udder injuries, or

mammitis. The sickness may be a serious disease, and the calf becomes affected. Considering the prevalence of tuberculosis in some of the main dairying districts, the danger of feeding milk from tubercular cows presents a continual menace; such being the case, the skim milk needs boiling or heating to 180 degrees Fahrenheit to kill the germs of the disease. The mere fact of cattle showing pronounced signs, or succumbing to tuberculosis at under two years of age, is convincing proof that the disease was contracted when in the calf stage. Steam should be used in all dairies, and not much extra expense is required to enable the fixing of a steam pipe to heat the milk. During the warm weather, the boiling prevents the milk from souring.

Many farmers who are strictly clean in ordinary daily routine work, are plainly neglectful with the calves—dirty drinking vessels and filthy calf pens are the surest causes of failures in calf rearing. Calves would be better exposed to all rigors of climatic changes than confined in unhealthy pens. Calf pens need impervious floors, and raised wooden platforms supplied with plenty of bedding. To allow the calves to camp on an accumulated mass of semi-decomposed manure, is courting disaster, and one of the surest ways of inviting pneumonia. The pens should be erected on well-drained ground, and face the morning sun, and be so constructed as to permit of the drafting of the calves according to their ages. The sheds should be limewashed, and the drains and floors well sprinkled with lime—it adds to the appearance, and helps to preserve healthy conditions.

One of the healthiest methods of rearing is to erect a grass hay-stack in the calf paddock, and allow the calves to have access to it; they can eat at will, and always have the benefit of a sheltered side.

For the calves of advanced age, a small water-trough is needed in their enclosure. When very large troughs are used, the water becomes stale, unless emptied frequently.

Calves are often the victims of foolish pranks by children who are ignorant of the damage they are doing. When calves have been frightened and ill-used, they always are in fear, and never develop into the leisurely, good-tempered animal so much desired. Do not allow horses to run in the same paddock, as they frequently kick calves, who will persist in getting in the way.

The calf pens should be at a distance from the main dairying building, the bleating of the young animals agitate the newly-calved cows, and the presence of either one is detrimental to the well-being of the other.

By feeding the calves at regulated intervals, their organs of digestion become accustomed to their work. Dairy calves are generally fed twice daily; this should be early in the morning and late in the evening, to more evenly regulate the period elapsing between the meals. Calves are creatures of habit, and pay well for a definite system of treatment.

When the young calf is two or three weeks old, it begins to eat hay, at first only a straw at a time, but the longing increases very quickly, and if fine hay is supplied, either lucerne, clover, or meadow, the calf does well on it, and suffers less from scours. The hay should be fed in small racks in a sheltered position.

Once the feeding has commenced, any ordinary farm hay or grain may be utilized. Use only small mangers or troughs, and do not allow any stale food to remain.

Chaff and bran may be given when pastures are scanty, and silage is relished by them when the taste is acquired; but avoid mouldy or fermenting food, as scours are certain to result.

A cupful of limewater given in the milk once daily reduces the scour.

Limewater.—Place a few handfuls of quicklime in a tub and fill up with water. Stir up, and allow to settle; the clear water is limewater. When used, fill and stir up again until all the lime is absorbed, which may be seen by breathing through a tube into the limewater. If lime is present, the water will become cloudy. If all the lime has been used up, the water will remain clear, and more lime needs adding.

Ringworm.—This skin disease is very prevalent amongst calves. White scaly patches appear, without hair—most abundant about the head and neck. It is caused by a vegetable parasite. The patches may be destroyed by applying red mercurial blistering ointment, made by mixing one part biniodide of mercury with sixteen parts of lard. The parts should be prepared by scraping off the scales before applying the dressing.

Early maturity must become an important factor in dairy farming as progress is made, and, in perusing the returns, we find this welcome ability strongly inherent in our dairy cattle.

Even since the breeding of cattle has been seriously entered upon, early maturity has been one of the greatest aims, not only in dairying, but in all branches of live stock husbandry. A much quicker turnover of capital, and a greater return for the food supplied, is obtained from the younger animals, as their powers of digestion and assimilation are more pronounced.

Cattle which possess heavy milking qualities at an early age must have an added value, and the performances of the one year and ten-month old heifers, under herd testing conditions, have every claim to recognition. The return of 304 lbs. fat (over £15 worth), and the 16 lbs. of 6 per cent. milk on the last day of the nine months, speaks well for the breeders and the phenomenal dairy development of their cattle. On appearance, these animals have not suffered in any degree. If the heifer's bodily development receives a check when young by supplying insufficient nutritious food, no amount of extra feeding afterwards can compensate for the former neglect.

While the early maturing qualities of some of our cattle are so strongly developed, there is perhaps a limit in this direction, so much so, that the constitution of the animal may be impaired, and loss of powers of production may result after a few lactation periods.

The old practice of keeping dairy heifers until three years and over before calving, is a thing of the past, and the extra size of the animal, or the yield in milk and butter, in no way compensates for what might be termed one year of idleness. I consider that two years and three months is young enough; but the idea of allowing them to be three years old before coming into profit is false economy.

When the testing of cows becomes general—as it must do—cows then will be sold on performance, and their untried heifers on the performances of their dams. Greatly increased prices to what generally exists to-day will then be obtained.

NINE MONTHS' TEST PERIOD.

Average Production at Different Ages.

Number of Heifers.	Age in months.	Milk.	Test.	Fat.	Com. Butter.	Milk last day.	Fat value 1s. per lb.
		lbs.		lbs.	lbs.	lbs.	£ s. d.
8 ..	22·3	5,141·06	5·92	304·73	347·38	16	15 4 9
26 ..	25·8	5,545·81	5·27	312·93	356·74	15·48	15 12 11
9 ..	33·1	6,896·44	4·75	327·66	373·67	14·36	16 7 7

While 102 heifers secured certificates under the 175 lbs. fat standard, 43 made 275 lbs. fat and over, and averaged 26.7 months old at the time of calving, and in their nine months' test period, yielded 6,032 lbs. milk; test, 5.21; fat, 314.5 lbs.; and 15½ lbs. milk on the last day of the nine months. When the fat is taken at 1s. per lb., the return is equal to £15 14s. 6d. per head, which would be considerably augmented in a twelve months' season, as they are yielding nearly 1 lb. fat on the

Ayrshire Bull "Wallace of Gowrie Park," his Dam, Laura, and First Progeny, "Bloomer of Gowrie Park."

last day; so that the return would be in the vicinity of £17 per head; also the value of the skim milk, rich in non-fatty solids, which, in these days of high prices, is worth at least 2d. a gallon, but for comparative purposes is put at 1d. per gallon, equals £2 10s. In addition must be added the value of the pure calf, which, in the case of the above heifers, is easily worth £20. Seeing, then, that at two years three months, which is slightly above the average, they started to produce, if they had begun at three years old, the above-mentioned returns would be lost. Such heifers can be reared for £7—

Six months' skim milk, at 1d. per gallon (2 gallons daily)	£1 10 0
Twelve months' grass, at 9d. per week ...	1 19 0
Nine months' grass, at 1s. 3d. per week ...	2 8 9
Labour	0 10 0
Hay, or chaff, or grain	0 10 0
	£6 17 9

The following analysis of the returns of heifers under the Herd Testing Regulations, will show the value of breeding and caring for good animals, and also the value of testing as demonstrating their productive qualities.

Name of Heifer.	Owner.	Breed.	Milk.	Test.	Butter Fat.	Com. Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
			lbs.		lbs.	lbs.	lbs.		
TWO YEARS TO TWO YEARS SIX MONTHS (INCLUSIVE).									
1. Ivoline of Gowrie Park	W. P. Brisbane	Ayrshire	8,564	4·84	414·78	472·75	19½	2 years	Heather Jock II.
2. Bloomer of Gowrie Park	W. P. Brisbane	Ayrshire	8,138	4·02	375·75	428·75	25½	2 years 1 month	Wallace of Gowrie Park
3. *Linnett of Gowrie Park*	W. P. Brisbane	Ayrshire	7,785	4·61	359·03	409·25	19¼	2 years 5 months	Lessnessock (imp.)
4. Sparkle	C. D. Lloyd	Jersey	9,972½	6·32	368·85	409	15	2 years 1 month	*Lucy's Noble of Oaklands*
5. Parrakeet	Gordon Lyon	Jersey	7,287	4·70	342·65	390·5	18	2 years 2 months	Nellie's Defiance
6. Lassie Fowler of Melrose (467)	W. Woodmason	Jersey	5,977	5·69	340·32	388	15½	2 years 1 month	Pretty Noble (imp.)
7. Chevy VIII. of Melrose	W. Woodmason	Jersey	6,011	5·63	338·56	387·75	19	2 years 3 months	Pretty Noble (imp.)
8. Foxglove of Springhurst	J. D. Read	Jersey	6,073½	5·44	329·75	376	14½	2 years 2 months	Captive
9. Peerless Pearl	F. Curnick	Jersey	6,000	5·34	320·71	365·5	15	2 years 3 months	Larkspur's Lord Twylish
10. Goldleaf	Department of Agriculture	Red Poll	6,437¼	4·79	308·50	351·5	14	2 years 3 *months*	Tabacum
11. *Empire of Melrose* (470)	W. Woodmason	Jersey	5,661	5·42	307·08	350	15	2 years	Pretty Noble (imp.)
12. May Bee	G. D. and H. S. Wood	Jersey	4,863	6·19	301·25	343·5	14½	2 years	*Captor*
13. Dainty VI.	Trevor Harvey	Jersey	5,306	5·66	300·33	342·25	19½	2 years 5 months	Young Black Antimony
14. Edith of Melrose (462)	W. *Woodmason*	Jersey	5,418	5·48	296·69	338·25	14	2 years 6 months	Pretty Noble (imp.)
15. Nightshade of Springhurst	J. D. Read	Jersey	5,963¾	4·97	296·50	338·25	21½	2 years 1 month	Young Defiance
16. Tulip of Gowrie Park	W. P. Brisbane	Ayrshire	6,588½	4·47	294·26	335·5	27½	2 years	Lessnessock (imp.)
17. Lily IV. of Melrose	Wm. Woodmason	Jersey	5,020¾	5·83	293·20	334·25	13½	2 years 5 months	Clementine II. Beau
18. Banker VI. of Melrose	Wm. Woodmason	Jersey	5,744½	5·08	291·90	332·75	20½	2 years 5 months	Wild Rover
19. *Princess of Tarnpin*	C. G. Knight	Jersey	5,674	5·07	287·98	328·25	11½	2 years 3 months	Starbright V. Lord Twylish
20. Chevy VII. of Melrose	Wm. Woodmason	Jersey	4,816½	5·97	287·63	328	12½	2 years	Mystery's Son of Melrose
21. Peerless VII. of Melrose	Wm. Woodmason	Jersey	4,683½	6·13	287·37	327·5	12½	2 years 5 months	Clementine II. Beau
22. Graceful Duchess X. of Melrose	Wm. Woodmason	Jersey	4,230½	6·68	282·75	322·5	10	2 years 2 months	Jessie IV. Son of Melrose
23. Buttercup of Springhurst	J. D. Read	Jersey	5,643½	5·59	282	321·5	14½	2 years 2 months	Young Defiance
24. Merlin	W. T. Manifold	Shorthorn	8,126	3·46	280·75	320·25	5½	2 years	Duke Coraguhac
25. Handsome *Girl VI. of Melrose*	Wm. Woodmason	Jersey	4,234	6·63	280·56	319·75	12	2 years 1 month	Jessie IV. Son of Melrose
26. Pleasance V. of Melrose	Wm. Woodmason	Jersey	4,859½	5·71	277·57	316·5	13½	2 years 1 month	Pretty Noble (imp.)
Average			5,545.81	5·27	312·93	356·74	15·48	25·8 months	

Analysis of the returns of Heifers under the Herd Testing Regulations—*continued.*

Name of Heifer.	Owner.	Breed.	Milk.	Test.	Butter Fat.	Com. Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
			lbs.		lbs.	lbs.	lbs.		
OVER TWO AND A HALF YEARS AND UNDER THREE YEARS.									
1. Stella of Gowrie Park	W. P. Brisbane	Ayrshire	9,398	4·75	446·42	509	22	2 years 8 months	Wallace of Gowrie Park
2. Polly of Melrose	Wm. Woodmason	Jersey	7,446¼	4·87	362·36	413	20½	2 years 8 months	Mystery's Son of Melrose
3. Queen Bee of Gowrie Park	W. P. Brisbane	Ayrshire	6,880	4·85	330·04	376·25	13½	2 years 8 months	Wallace of Gowrie Park
4. Martha of Gowrie Park	W. P. Brisbane	Ayrshire	6,529	4·88	318·39	363	13½	2 years 8 months	Dr. Cranwell
5. Ruby Queen of Gowrie Park	W. P. Brisbane	Ayrshire	7,174½	4·37	313·64	357·5	17½	2 years 10 months	Brown Lad of Gowrie Park
6. Moonlight of Gowrie Park	W. P. Brisbane	Ayrshire	6,896	4·51	311	354·5	12	2 years 10 months	Lessnessock (imp.)
7. Lady Grey V.	A. W. Jones	Jersey	5,437½	5·62	305·75	348·75	12	2 years 11 months	Guarantees Antimony
8. Pipio	Department of Agriculture	Red Poll	6,045½	4·08	282·86	322·5	17	2 years 11 months	Tabacum
9. Gladys of Gowrie Park	W. P. Brisbane	Ayrshire	6,340¼	4·39	278·50	317·5	..	2 years 8 months	Brown Duke of Gowrie Park
Average			6,896.44	4·75	327·66	373·52	14·36	33·11 months	
UNDER TWO YEARS									
1. Jennie Lind VIII. of Melrose	Wm. Woodmason	Jersey	5,639	5·78	326·08	371·75	15	1 year 11 months	Mystery's Son of Melrose
2. Luxury II.	E. N. and S. O. Wood	Jersey	6,177¼	5·26	325·25	370·75	15½	1 year 11 months	Topaz's Defender
3. Jessie of Melrose (428)	Wm. Woodmason	Jersey	5,063	5·99	303·25	345·5	18	1 year 11 months	Pretty Noble (imp.)
4. Eva	F. Carnick	Jersey	6,015½	5·00	301	343·25	20½	1 year 11 months	Larkespur's Lord Twylish
5. Peerless VIII. of Melrose	Wm. Woodmason	Jersey	5,443	5·52	300·25	342·25	15½	1 year 9 months	Mystery's Son of Melrose
6. Mistletoe of Tarnpln	C. G. Knight	Jersey	5,888½	5·01	295·09	336·5	17½	1 year 8 months	Starbright V. Lord Twylish
7. Blue Belle of Pine Hill	C. D. Lloyd	Jersey	4,781	6·16	294·15	335·75	14½	1 year 11 months	Starbright's Carnations Fox
8. Mystery XIII. of Melrose	Wm. Woodmason	Jersey	4,121¼	7·94	292·50	333·25	11½	1 year 11 months	Jessie IV. Son of Melrose
Average			5,141·6	5·92	304·73	346·75	16	22 37 months	

COMPLETE AVERAGES.

Total Number.	Age, in Months.	Milk.	Test.	Fat.	Butter.	Milk, Last Day.	Fat Value, 1s. per lb., 9 Months.
		lbs.		lbs.	lbs.	lbs.	£ s. d.
43	26·7	6,032	5·21	314·54	358·53	15·5	15 14 6

Many heifers are reared at a cheaper rate, but generally on very poor country; whereas, once in calf, they need the very best pastures or feed to develop them.

When heifers like the above are reared, by breeding on sound lines, the theory that it "Does not pay to rear calves," is easily refuted. There certainly are heifers that it does not pay to rear for dairy purposes, but they are generally the result of lack of knowledge, or neglect in some particular direction; although instances are on hand where farmers will continue to use bulls they know to be unprofitable, and scatter their progeny over the State, perhaps ruining some unfortunate farmer who secures them.

W. Woodmason's Jersey Bull, "Pretty Noble" (imp.).

To individualize in this splendid collection of heifers may be deemed unwarranted, but the performances of "Stella," and "Bloomer," belonging to Mr. Wm. P. Brisbane, call for special mention; while "Queen Bee" also did very well. These three heifers are by the bull "Wallace," of "Gowrie Park," who promises to excel as a sire of first class dairy stock.

Name of Heifer.	Milk.	Test.	Fat.	Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
	lbs.		lbs.	lbs.	lbs.		
"Stella" of Gowrie Park	9,398	4·75	446·42	509	22	2 years 8 months	Wallace of Gowrie Park
"Bloomer" of Gowrie Park	8,138	4·62	375·75	428·75	25½	2 years 1 month	Wallace of Gowrie Park
"Queen Bee" of Gowrie Park	6,800	4·85	330·04	376·25	13½	2 years 8 months	Wallace of Gowrie Park
Average ..	8,112	4·73	384·07	437·83	20·33	29·66 months	

The Government Herd Testing Scheme has not yet been long enough in existence to present a very complete list of sires showing consistent dairy heredity, but its influence for good will become more apparent as time goes on.

The Jersey bull "Pretty Noble," imported from the Jersey Islands by Mr. W. Woodmason, has proved himself the sire of very fine heifers, and the yields of the first seven to complete the nine months' test are given, which, for consistency and general ability, would be very hard to beat. It is a matter of satisfaction to know that our breeders, generally speaking, now import only animals having records of butter production. Though they are desirous of securing animals true to type, they realize that production is the main essential.

Name of Heifer.	Milk.	Test.	Fat.	Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
	lbs.		lbs.	lbs.	lbs.		
Lassie Fowler of Melrose (467)	5,977	5·69	340·32	388	15½	2 years 1 month	Pretty Noble (imp.)
Chevy VIII. of Melrose	6,011	5·63	338·56	387·75	19	2 years 3 months	Pretty Noble (imp.)
Empire 476 of Melrose	5,661	5·42	307·08	350	15	2 years ..	Pretty Noble (imp.)
Jessie 478 of Melrose	5,063	5·99	303·25	345·5	18	1 year 11 months	Pretty Noble (imp.)
Edith 462 of Melrose	5,418	5·48	296·69	338·25	14	2 years 6 months	Pretty Noble (imp.)
Pleasance V. of Melrose	4,859	5·1	277·57	316·5	13½	2 years 1 month	Pretty Noble (imp.)
Graceful Duchess 476 of Melrose	4,470	6·02	269·29	306·98	14½	1 year 8 months	Pretty Noble (imp.)
Average ..	5,351·2	5·69	304·68	347·34	15·6	24·8 months	

Decentralization is one of the burning questions of the day, and for our young, trained farmers to leave the land and seek employment at some apparently more attractive employment in the city, is indeed a loss to the State. The very root of this trouble often rests with the farmer who bemoans his fate, complaining of the ingratitude of his children. Enthusiasm is generally the keynote of success in any business, and this enthusiasm is lacking at many farms where, after years of dairy farming, the cows are not even named, and if any calves are reared, the sires and dams are either unknown or forgotten. During the present season, a large herd of dairy cows was disposed of, and, as the result of twenty odd years of dairy farming, the cows were sold without a name, and minus any record of their abilities as producers. This is only one of the many cases which could be cited, but is in itself a striking instance of the owner's neglect of his responsibilities, and disregard of common fairness to his business.

"Boys learn best by example." It is up to the farmers to look on the bright side of their calling—dairying, when worked by slack methods, becomes a drudgery. Any farmer who has any respect for his calling, should teach his children to love animals, remember their pedigrees

and capabilities in whatever line of production he is engaged in. Teach them to test the cows, and rear the calves from the best, and name the heifer when young. A farmer's boy, imbued with the right spirit and a respect for his calling, will be a great benefit to his father as the years pass by, and a direct acquisition to the producing interests of the State. Do not blame the children for not taking an interest in the dairy, when you show by example that you have not sufficient enthusiasm to test the cows and cull out the animals that never pay their way. Any bright, sensible boy wants to know what the future

Dam of "Pretty Noble," "Boutilliere."

holds in store for him, and he cannot be expected to kindle an enthusiasm in a business that is being decried by his own father.

If we are going to save the rural population, we must put our best efforts on the building of a home that will have all the conveniences of the city, with all the glory of the country, so that when the girls and boys reach womanhood and manhood, their one desire will be to remain on a portion of the old farm, and rear a home patterned after the one in which they spent the happy days of their youth.

PORTUGUESE VARIETIES OF VINES.

By M. d'A. Burney.

When Mr. de Castella visited Europe on behalf of the Victorian Government he made arrangements for the grafting in France of some varieties of Portuguese vines. The major portion of these vines imported by Mr. B. W. Bagenal, was acquired by Mr. A. Prentice, and was planted in his vineyard near Rutherglen. At the end of 1913 this vineyard was purchased by Burgoyne Bros. As it contains the largest area under Portuguese varieties in Australia, it may be of interest to record the result of the 1916 vintage, as each variety has been gathered, weighed, and fermented separately. In the two previous years the crop was so small that separate treatment was quite impossible. The wine resulting from the mixture is totally different in style and character from any other sweet wines produced here; but, as the varieties were mixed, it was impossible to attribute this difference to any one variety. The three varieties are Touriga, Alvarelhão, and Bastardo. These may be considered to be the most important of the varieties cultivated in Portugal, but there are others which find favour in Portugal and which are not included in the Mount Athos vineyard. Among those absent it would be of interest to mention:—Souzão, Mourisco Preto, Donzellinho do Castello, Tinta Cão, Tinto Carvalhõ, &c., all of which are largely cultivated in Portugal. The selection made by Mr. de Castella was, however, for the purpose of obtaining grapes of the finest quality only for the production of wines of a port type.

The results obtained at the 1916 vintage appear to amply justify this selection. In order to compare the yield of these Portuguese varieties with other varieties well known in Australia, the following table showing the yield per acre and the sugar strength of the bulk will be of interest. Considerable care was taken to pick each variety separately in order to get an absolutely accurate estimate of the yield per acre. Picking took place of all the varieties described below upon the 21st and 22nd March:—

Variety.	Yield per Acre.			Sugar Strength.
	tons.	cwt.	qrs.	Beaumé.
Touriga	2	6	3	12.5 degrees
Bastardo	2	4	1	13 degrees
Alverelhãe	1	15	1	13 degrees
Grenache	2	6	0	14 degrees
Shiraz	2	3	0	16 degrees

It will be seen that the sugar strengths are appreciably less than Grenache and Shiraz picked under similar conditions. The soil is of schistose formation, with a considerable proportion of stone running through it. The appearance of the grapes at the time of vintage was deceptive. Bastardo is the earliest vine to come into leaf. The grapes appear to ripen earlier than Shiraz, but the vegetation is by no means

luxuriant, and the leaves start to fall early. In 1915 the sugar strength of Bastardo was 16 degrees at the beginning of vintage in February. The lower sugar strength this year was probably due to insufficient foliage to nourish the crop, but the bunches contained a very large percentage of raisins, of which the sugar was not in solution in the must when the sugar strength was taken.

Alvarelhão is a far more vigorous grower, and the somewhat pale-coloured bunches were extremely numerous, but they weighed very badly. The berries had started to shrivel, and the acidity strength had greatly diminished. At the same time, this variety could have been picked later with advantage, although in appearance complete maturity had been reached. Judging from the experience of the 1916 vintage, Alvarelhão is not a heavy bearer, and must be classed as a quality grape pure and simple.

Touriga carried a good crop, which proved to be larger than that carried upon the Grenache, although in appearance the crop on the Grenache seemed very much superior. The bunches were solid and well filled, and showed no signs whatever of shrivelling from the heat. This must be classed as a variety ripening later than Shiraz, and standing dry weather better. If it had been picked later the sugar strength would undoubtedly have been greater. This appears to be an extremely valuable vine. The yield is satisfactory, it resists drought well, the berries are thick-skinned, and stand weather, and the quality of the wine is at present showing great promise. It is a variety to be recommended for extensive culture. As it appears to ripen later than Shiraz it should be of very great utility in the Rutherglen district for dry wines as well as sweet.

All the Portuguese varieties were fermented in the same manner. The grapes were stemmed and crushed, and the must was pumped into the fermenting tanks in the ordinary way. Yeast was at once added of a variety cultivated by Mr. de Castella, and which was used for the whole Mount Ophir vintage. No false heads were used, and the skins were allowed to rise to the surface. As soon as the marc became firm the liquid was run off from the skins on an average 24 hours after the vats had been filled. Contact with the skins might have been prolonged with advantage with Bastardo and Alvarelhão without unduly increasing the colour. Touriga if left in prolonged contact with the skins would produce a wine of very deep colour. Fermentation was checked by fortification when the must of each variety had been reduced to about 5 degrees Beaumé. Owing to a limited spirit supply each variety did not receive identical treatment, and a slight variation in sugar content resulted. During fermentation each variety had a totally different perfume to the better-known European varieties. In the case of Alvarelhão this was especially marked.

The wines resulting are now entirely distinct. Alvarelhão has a pronounced bouquet and pungent almost peppery flavour. Bastardo is a pale-coloured wine with a most marked raisin flavour. Touriga is a wine of distinctive character, and a flavour already suggesting vintage port. Grenache treated under identical conditions is a far more neutral wine.

At a later stage it will be more easy to arrive at a true estimate of the relative quality of each variety. At present the wines show great

promise, and seem to be quite different from the produce of any other European varieties. It is already obvious that to obtain a wine of a "vintage" type more prolonged contact with the skins is necessary. In Portugal prolonged maceration is the rule, whether the wines are intended for "vintage" or tawny types. Here in Australia Brown Muscat is frequently introduced into port blends, with the result that the blend losses any resemblance that it may have had to true port. Pale-coloured Australian ports which win prizes at wine shows in Australia have usually greater resemblance to brown sherry than to any other European wine. In Portugal wine-spirit only about 30 over proof is used for the fortification of the best quality wines. This is probably with the object of reducing the percentage of acidity, which does not find favour with the English palate. In Australia, where complete maturity can always be obtained, absolutely silent spirit should be preferable.

There are already cellars in Australia containing very fine old wines of the port type made from Shiraz, Grenache and other varieties which are not cultivated in Portugal. The varieties now in full bearing in the Mount Athos vineyard should enable a great improvement to be made in producing a type of wine more closely resembling true port, and for which there is a large market in Great Britain at a high price.

It is obvious that there is still much to be learned in the handling of these Portuguese varieties, but the results of the 1916 vintage should enable us to emerge from the experimental stage and act with a considerable degree of certainty in the production of wines of the port type in the future.

As reasonable success has already been achieved in the production of wines of a port type in Australia from varieties of grapes hitherto confined in Europe to the production of dry table wines, it is obvious that Australia possesses conditions of soil and climate entirely favorable to the production of sweet wines. The introduction of the true Portuguese varieties must therefore logically improve the type of wine the moment that we can learn by experience how these varieties should be treated.

Notes on Portuguese Vine Varieties.

By F. de Castella, Government Viticulturist.

Mr. Burney's note on the results of the Alto Douro Vine varieties growing at Mount Athos vineyard will doubtless be read with much interest by all Victorian wine-growers producing wines of port type.

Rutherglen, and several other parts of the north-east of Victoria, have already produced sweet wines of remarkable quality, and this mainly from grapes usually cultivated in France for dry wine production. The similarity of climate and soil to those of the Alto Douro makes it highly probable that the utilization of the vine varieties which yield the world's highest grade sweet red wines may have results of far-reaching importance in Australia.

Independent expressions of opinion, such as Mr. Burney's note, are of the greatest value at the present time, when we are beginning to cultivate, on a commercial scale, many recent introductions of considerable promise. Undue multiplication of varieties is no doubt undesirable, but there is reason to believe that some of the new-comers will

prove valuable additions. Some may even prove superior to, and eventually displace, some of our older favorites Such additions or substitutions must be entered on with caution. Recent introductions are being regularly and continuously tested, by this Department, at the Rutherglen Viticultural Station, but the co-operation of private growers in thoroughly testing these new vines is most welcome, and is cordially invited. It is hoped that Mr. Burney's excellent initiative will be followed by other growers.

The occasion is, perhaps, opportune to give some extracts concerning the true port varieties, their cultural and wine-making peculiarities, from the writings of leading Portuguese authorities.

An Explanation.

Mr. Burney gives the writer considerably more credit than he deserves in connexion with the introduction of the port varieties at Mount Athos. As the planting of these may quite possibly mark an epoch in our wine-making history, it is well that the facts, which in themselves are interesting, should be here recorded. It is true that in the course of his viticultural investigations in the Peninsula in 1907, the writer was able to secure from the Real Companhia Horticolo-Agricola Portuense, of Oporto, grafted rootlings of several choice Portuguese varieties which were planted in the collection of the Rutherglen Viticultural Station in 1908, where they are still growing. The following sorts were secured:—Alvarelhão, Bastardo, Cornifesto, Donzelinho do Castello, Tinta Amarella, Tinta Carvalha, Tinta Roriz, Touriga. Several others, notably Souzão, Mourisco Preto, Tinto cão, were not obtainable. The vines, the packing of which was scarcely adequate for so long a voyage, arrived only in fair order; nevertheless some of every variety imported, survived.

The extensive plantation at Mount Athos is to be credited to the initiative of Mr. Alec. Prentice, who, in 1910, managed the property (then known as Emu vineyard) for Messrs. Prentice Bros. Mr. Prentice, who was then placing a considerable order for grafted vines with Richter's nursery at Montpellier (France), through Mr. B. W. Bagenal, was desirous of obtaining some of the best Port varieties. The writer was consulted as to the most suitable sorts. Port is remarkable as being the product of a greater number of distinct varieties than most celebrated wines. For the sake of simplicity, the following four were recommended as likely to combine most of the qualities characteristic of a high-grade port:—Alvarelhão, Bastardo, Touriga, and Tinta cão.

Mr. Bagenal, who was then leaving on a trip to Europe, was commissioned by Mr. Prentice to secure the necessary scions.

After repeated endeavours, he failed to do so from the leading London wine merchants, whose Oporto representatives, in his opinion, showed the same reluctance to part with any of their stock as do South African ostrich farmers. In France he was more fortunate, M. Richter being eventually able to secure the desired scions through an ex-student of Montpellier College then residing in Portugal. These scions were grafted in Richter's nurseries in January and February, 1909, struck in nursery in the usual way, and shipped to Melbourne in cool storage in 1910.

The Vines of the Douro.

The region of the Douro is without contradiction the most notable of all the viticultural regions in Portugal. It is the cradle of the most celebrated wines of the world, of those famous and inimitable ports (*Vinhos do Porto*) which have so justly acquired renown by the suavity of their flavour, by the exquisite quality of their ethery bouquet, by the nobility and solidity of their substance (*Compleição*). Princely wines, as they have been aptly termed, so rare are the precious qualities which distinguish them.*

Sr. Cincinnato da Costa, the author of the above, goes on to describe the district where they are produced; the broad band along the River Douro and its tributaries, from Barca de Alva, on the Spanish frontier, to Barqueiros, which adjoins the region of Entre Douro e Minho. A viticultural district as remarkable for the disposition and nature of the soils on which they are planted as for the quality of the vine varieties which are mainly grown.

The number of different varieties is very considerable. The Visconde de Villa Maior, one of the best-known writers on the port wine region, considers the following 28 varieties to be best known and most widely grown:—†

Black Grapes.—*Alvarelhão* (including two sub-varieties), *Bastardo*, Casculho, *Cornifesto, Donzellinho* (three sorts), Entreverde, *Mourisco tinto*, Mureto, *Nevoeira*, Peagudo, *Souzão, Tinta amarella, Tinta carvalha*, Tinta castelloa, *Tinta francisca or franceza*, Tinta lameira, Tinta morella, Tinta pinhiera, *Tinta cão*, and *Touriga*.

White Grapes.—*Codega* or Malvasia grossa, Diagalves; Donna branca; Gouveio or Verdelho (two varieties); Malvasia, of which there are several sub-varieties; *Muscatel*, likewise; Rabigato or Rabo de Ovelha or Estreito.

It is rather curious that Grenache, which produces such remarkable sweet wines, both in Spain and in France, should not be included in the above list. It is grown in small quantity on the Douro, where it has long been known under the name of *Tinta Aragoneza*. Gyrão mentioned it as long ago as 1822, as being grown on the Douro, where it had proved a good bearer, but required a strong soil. It is very largely cultivated in another Portuguese province, that of Alemtejo, south-east of the Tagus River and along the Spanish frontier, but cannot in any sense be looked upon as a regular constituent of port wine.

In the following lines it is proposed to first deal with the three varieties mentioned by Mr. Burney, and afterwards to describe a few others which are of almost equal interest. It may be here mentioned that M. Richter's Portuguese correspondent was unable to obtain scions of Tinta cão.

Alvarelhão.

This vine is described by Sr. Cincinnato da Costa as being one of the choicest black grapes grown on the Douro, where it is cultivated on a large scale in the sub-region of Baixo-Corgo, near Regua, where, in combination with Bastardo, it forms the basis of the composition of the best port wines. It is also to be met with in all this region as far as Barca d'Alva.

* *O Portugal Vinicola*, by B. C. Cincinnato da Costa.—This fine ampelographical work contains descriptions and life size illustrations of 94 Portuguese vine varieties.

† The names printed in italics are those of varieties described in detail in *O Portugal Vinicola* as being typical Douro varieties.

It is interesting to note that it has a good reputation as a quality variety, for the production of wines of totally different character to port, in other parts of Portugal, especially in the north, where the so-called green wines are grown. These are very light dry red wines of high acidity.

In Minho (extreme north of Portugal), especially at Amarante and at Basto, Alvarelhão, under the name of *Locaia*, is very much appreciated. Here it is cultivated on high overhead trellises or *uverias*, a mode of culture which causes the nature of the grape to differ considerably from that of the same variety, trained as a low vine in the centre of the hot Douro region. Nevertheless, the generous virtues peculiar to this vine are such that the wines of Basto are still held, and justly so, to be the best in the province of Minho.

In the province of Traz os Montes, Alvarelhão is well known under the similar name of Alvarelho.

According to Villa Maior there are, at least, two varieties; that which is called *pé roxo* (red foot) or *pé de perdiz* (partridge foot) is the best. The other, called *pé branco* or *verde* (white or green foot or stalk), being inferior. A third, with a still darker stalk, is sometimes distinguished, under the name of *pé preto* (black foot), but this is considered to be identical with the first.

Alvarelhão pé de perdiz is doubtless one of the best sorts cultivated in Portugal, by the qualities it communicates to the wine, and, in our opinion, it should, on this account, be much more propagated than it has so far been. It ripens towards the end of August or commencement of September, and is one of the sorts which ripen most regularly. Its bunches do not decay in wet years, nor do they fear drought much, especially in light soils. On heavier soils it produces abundantly. On the Douro it is trained low and pruned long. It is rather liable to oidium. At complete maturity, end of August, it gives, according to Villa Maior, 62 kilos. of juice per 100 kilos. of bunches, this juice containing .131 of acid (estimated as sulphuric) and 26.66 per cent. of sugar (14.4 Beaumé). It produces bunches of medium size, somewhat branched, usually 18 to 19 cm. (7 to 7½ inches) long. Its berries are of rather small size, oval, loose, detaching themselves readily from the stalk, and of a bluish tint, except a few which tend towards violet. The usual dimensions are 15mm. longitudinal by 13mm. transverse section (.59 in. x .51 in.). I have occasionally seen rather larger samples from Mirandella."

"In flavour this grape is very agreeably sweet, at the same time striking the palate by a peculiar acidity, which gives it quite a characteristic piquancy, making it most acceptable. It is generally used for wine making, though it is appreciated by some for the table on account of this peculiar flavour. The special quality of this variety caused Rebello da Fonseca to strongly recommend it, both as a scion for grafting and for new plantations, near Lisbon, in order to completely correct the flat after-taste, for which that author blamed the wines of this part of Portugal."

"The must of Alvarelhão is pale in colour; the yield of juice is fair—81 per cent. by weight—100 kilos. of grapes gave 74 litres of liquid (162.8 gallons to the ton). This was in 1899 vintage. Villa Maior held the yield to be less, or 62 per cent. (124 gallons to the ton). These discrepancies are not surprising, seeing how grapes from different localities may vary. Villa Maior estimates the sugar content at 26.6 per cent (about 14.4 Beaumé), whilst my analyses fix it at 21.5 per cent. (about 12.1 Beaumé)."

"It has not been possible for me to study the wine made from this grape alone; nevertheless, from what I know of the composition of the must I am led to think that Alvarelhão alone should give wines of excellent character, soft, mellow *claretes*[1], of well-proportioned alcoholic strength and delicately aromatic. If the wine is made by the process known as *de Feitoria*, as is the usual practice on the Douro, it should possess considerable freshness and grace, which will be given to it by the high acidity of the skins. Whilst the acidity of the must

[1] The word "clarete" is used in Portuguese to describe a light, dry table wine—a claret.

is usually about 2.5 to 3 per thousand (estimated as sulphuric), the acidity of the skin goes up to 5.8 per thousand.[2] . . . . . The work of *feitoria* (trampling) causes the wine to benefit from this higher acidity of the skins, which thus raises the average acidity of the must.

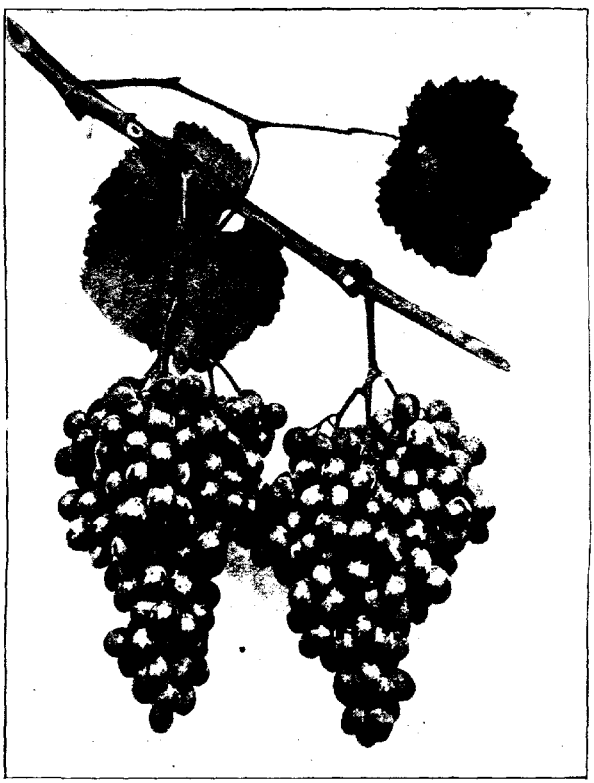


Fig. 1.—Bunches of Alvarelhão Grapes.

Reproduced from *O Portugal Vinicola*, by B. C. Cincinnato da Costa, reduced to .37 (approximately one-third) natural size.

A fact well in evidence in the case of this variety, which, however, has been also remarked to a greater or lesser degree in the majority of the varieties analyzed, is that the major part of the acid of the grape resides in the skin, the pulp coming next, and the stalks last, so far as acidity is concerned. Though further investigation is desirable to confirm this point, it seems to me to be one which should be duly weighed by wine-makers.[2]

[1] Estimated as tartaric acid, these figures would be respectively 3·8, 4·6, and 8·8 per mil.
[2] The foregoing quotations are from *O Portugal Vinicola*.

He then gives the ampelographical description which was drawn up by the Trasmontana (N. Portugal) Agricultural Station, which agrees on most points with that given in *Ampelographie*[4], which is reproduced.

Rebello da Fonseca, so long ago as 1791, states—"With the grapes known as Alvarelhão, Pé agudo preto, Tinta cão, and Souzão is made a strong wine of good colour and body, and with fine flavour. With Bastardo and Donzelinho, mixed with the foregoing in small proportion, the roughness of the Alvarelhão and Souzão is softened and sweetened, and the fragrance of the bouquet is increased.

Fig. 2.—Leaf of Alvarelhão ·44 (approximately half) natural size.

Photo taken at the Rutherglen Viticultural Station, April, 1913.

He proceeds to discuss, at considerable length, the benefit to the Portuguese wine industry of the substitution of choice for common vines, and quaintly describes the curious flavour of Alvarelhão already referred to, explaining that "its juice is sweet, with a suggestion of roughness" (*pico azedo*) "similar to well-sweetened lemonade." This variety then formed the basis of the wines of the Alto Douro to such an extent "that with respect to all other red varieties together, Alvarelhão constituted three parts out of four."

[4] *Ampelographie*, published under the direction of P. Viala and V. Vermorel. A full description is given of 5,200 distinct vine varieties, articles being contributed by leading authorities in all the important wine-producing countries.

Gyrão (1822) recommends blending Alvarelhão with other sorts, and in not too considerable a proportion, since its wine is of poor colour. He nevertheless states that "it yields a wine of the most graceful piquancy (*do mais engraçado pico*) that one could have." He further states that this vine "and also Donzelinho de Castello are of such good quality that even laterals and suckers bear grapes, thus forming an exception to the rule." From this it would seem that even in case of damage by frost this variety would still yield some fruit.

Figueridо (1875) describes Alvarelhão as a grape-producing wine of quality (*Vinho fino*), of light colour, fairly astringent if made with thorough *feitoria* (trampling), which, with age, acquires precious qualities, developing into a most generous wine. From this grape, without addition of alcohol, and with little trampling, can be made a delicious light table wine (*Vinho de Pasto*)—the best that we know. . . . . Its yield cannot be depended upon with as much certainty as that of Touriga; it gives a wine more open (lighter) in colour, very aromatic, and fairly alcoholic.

The description of Alvarelhão in *Ampelographie* is contributed by Sr. Duarte de Oliveira. He quotes from several of the authors whose works we have made extracts from, and gives some further information concerning this variety, from which the following is abridged:—

Alvarelhão is one of the oldest varieties in the regions of Douro and Tras os Montes, where it was formerly preferred in large vineyards on account of its always giving a very special character to the wine into the composition of which it entered. It certainly plays the principal part in the wines which have made the world-wide reputation of Port.

In Douro and Tras os Montes Alvarelhão is usually pruned long. In these regions it is a very good bearer, but in Minho it produces little unless pruned very long. Being very subject to *coulure* (faulty setting), its bunch contains many small seedless berries (*millerandé*) if blossoming occurs in damp foggy weather. Even if the fruit appears to set satisfactorily, the berries are liable to drop off afterwards (in this respect it seems to resemble Malbeck).

It is very liable to oidium, requiring much sulphuring; it is much less sensitive to downy mildew. In view of the exquisite delicacy of flavour it communicates, the wine-taster can immediately recognise it, even if present in small proportions, in a wine. . . . . It causes Port wine to age, since it favours oxidization; thus, a wine containing some Alvarelhão in its composition might, at eight years old, be easily mistaken, as regards colour, for a wine of ten or twelve years.

The following ampelographical description is given:—

"*Vine.*—Vigorous, spreading grower; bark dark brown, with readily detachable grey strips; buds large, white, and downy; young growth whitish, with carmine edges.

"*Canes* of medium thickness, very long; wood hard and brittle; internodes fairly long (10-14 cm. = 4 to 5½ inches); striations well marked; of vinous red colour; buds medium; tendrils numerous and strong.

"*Leaves.*—Five-lobed, large, as broad as long, thick, hard to the touch, crisp, fleshy, bulged (between the veins); upper surface dark green, with traces of fine tomentum, resembling cobweb; under surface downy and of yellowish green; lateral lower sinus deeper than the upper; petiolar sinus deep, forming an elongated eliptical opening—main veins strongly marked and secondary veins prominent. Teeth almost equal, medium, slightly mucronate; terminal teeth large and of irregular form. Leaf stalk short, compressed for one-half of its length, and downy.

"*Fruit.*—Bunch fairly large, irregularly conical, usually loose, sometimes with one or two short wings; stalk long, wine coloured, somewhat herbaceous;

pedicels long, slender, with a pronounced warty swelling; berries medium, rather on the large side, ellipsoidal, dark, glossy, bluish black, juicy, and delicately perfumed; with short and weak brush[1]; skin hard, containing little colouring matter; juice very sweet and delicate."

Alvarelhão is very easy to identify, in view of its characteristic foliage, which differentiates it sharply from most other varieties, so that any one at all familiar with it can readily pick it out. One of its most striking characteristics is the peculiar funnel shape of the majority of the leaves; the midrib is often a continuation of the leaf stalk, the limb being rolled or twisted round; it is scarcely ever flat, nor can it be pressed so without a fold or crinkle. Though difficult to adequately portray without a stereoscope, this is fairly well shown in Fig. 2, and perhaps better in Fig. 3; it is also in evidence in the smaller leaf shown on Fig. 1. The ribbed and goffered texture of the substance of the

Fig. 3.—Vine of Alvarelhão at Quinta de Roriz, Alto Douro, Portugal.

Photo taken in October, 1907. The curious slate trellising posts are shown, also the terraced arrangement of the vine land. The stairway at the top right hand corner leads to a higher terrace.

leaf, between the secondary veins, is also characteristic; this is shown in Fig. 2. In colour, the leaves are dark green above and whitish beneath; the traces of cotton on the upper side and on the leaf stalks give a characteristic grey look to the whole vine, as though it had been lightly dusted with ashes, somewhat after the style of Pinot Meunier (Miller's Burgundy), though not to nearly the same extent.

From the above, two facts stand out. First—That Alvarelhão is in a large measure responsible for the peculiar character of Port wine. All connoisseurs are familiar with the curious "dry finish" of a true

[1] By "brush" is understood the fragment of pulp adhering to the pedicel when the berry is pulled off.

Port. Though the wine is distinctly sweet when first tasted, it leaves a dry and absolutely clean impression on the palate, and in this it differs radically from wines of Port type, which have as yet been produced in Australia. There seems good reason to believe that the peculiar acidity or roughness attributed to the Alvarelhão grape by most Portuguese writers is mainly responsible for this characteristic of this world-famed wine.

Second—That in order to extract the full measure of quality from Alvarelhão grapes, the *feitoria* (literally factory) method of wine making must be applied to it. This has been fully described in this *Journal* (March, 1908, p. 185). In brief, it consists in fermentation on the skins in shallow vats or *lagares* made of granite slabs; repeated tramplings by gangs of men with bare feet being given at intervals of

Fig. 4.—The "Feitoria" method of Port wine making. Trampling the grapes in shallow granite vats or "lagares" in the Alto Douro district, Portugal.

Reproduced from "Facts about Port and Madeira," by Henry Vizetelly.

from six to twelve hours during the whole course of fermentation. The wine remains on the skins usually from three to four days. Sometimes the stalks are wholly or partly removed, sometimes they are not removed at all. Without this repeated stirring the acidity and bitterness contained in the skins of the Alvarelhão grapes, so largely responsible for the leading characteristic of true Port, will not be properly extracted and communicated to the wine. (See Fig. 4.)

Is tramping with the feet really necessary? It would appear not. Duarte de Oliviera, in a quite recent work[1] on wine making, holds that the time-honoured *feitoria* method is merely a survival of ages past, and that it would be cleaner and better in every way to substitute repeated ramming and agitation with wooden rammers for trampling with the human foot.

[1] *Vinificação*, by Pedro Bravo and Duarte de Oliviera.

(To be continued.)

FEEDING TERMS.

By B. A. Barr, Senior Dairy Supervisor.

Some Simple Explanations.

Simple definitions of the following terms used in stock feeding are offered with a view to assist a proper understanding of the importance of economical feeding, especially when it is necessary to make use of purchased foodstuffs. High prices for dairy stock are likely to be maintained for many years. The prices of dairy produce will be regulated, when normal conditions again obtain, by the world's supply and demand. The farmer cannot regulate the price of dairy produce in proportion to the cost of dairy cows, but attention may profitably be given to increasing the production, and, at the same time, lessening its cost. In other words, dairy farming should be specialized. One method of lessening the cost of production is to remove all cows which do not pay for feed and attention; and another is to increase the supply of food as long as an adequate profit is returned.

Protein.

Protein is a term applied to a group of substances present in varying amounts in all foodstuffs. It is composed of the elements carbon, hydrogen, oxygen, and nitrogen, frequently sulphur, and sometimes phosphorus and iron.

Protein in the food is essential to the building up of flesh, and to milk secretion. The albumen and casein, or curd of milk, are proteins, and the greater the amount of milk yielded the greater will be the amount of protein required in the food. In common cattle foods linseed and coconut oil cake contain the largest amounts; then follow gluten feed —pollv meal, pollard, bran, oats, crushed maize, green lucerne, clover, mixed grasses, green oats, barley, and maize.

The proteins form a very extensive group, and the protein of each particular grain of fodder is different in some characteristic from that contained in a different species or kind of food. Partly for this reason, a mixed ration is desirable, inasmuch as a combination of foodstuffs will insure the presence of all necessary groups, whereas a single feed might be deficient in an essential group. Also, the food value of the protein varies that present in the grains and mill products—bran, &c.—being greater than that contained in hay, green fodder, and roots.

The animal can only utilize economically sufficient protein to repair the wastage of tissues to promote growth, and to provide for milk secretion. In ordinary feeding, any excess above these requirements is passed off unused. An average dairy cow requires about .5 lb. of digestible protein daily for maintenance, and, in addition, .04 lb. for each pound of milk. Nevertheless, in making up a ration for milking cows, it is inadvisable to restrict the protein content to the theoretical amount, for two reasons:—(1) The food values of foodstuffs vary within wide limits; (2) a slight excess of easily digestible protein possesses a stimulating effect on milk secretion.

When applied to cattle foods, protein, albuminoids, and nitrogenous substances are synonymous.

Carbohydrate.

The term carbohydrate is given to a large group of compounds chemically related. They are composed of the elements carbon, hydrogen, and oxygen, and to this class belong sugars, starches, gums, cellulose, &c. In the animal body, carbohydrates are used for the production of energy and heat, and any excess is converted into body fat.

Unlike protein, any excess of carbohydrates over immediate requirements is not passed off unused, but is stored as a reserve in the form of fat.

Carbohydrates cannot replace protein, although protein may replace carbohydrate, but only at a high cost.

In the analysis of cattle foods, the term carbohydrate is given to the combined amounts of nitrogen free extract and crude fibre, and, although the estimation is not purely carbohydrate, no appreciable error is made by giving it an average carbohydrate value.

Fat.

Crude fat, or ether extract, although some of the members of this group consist of the same elements C.H.O. as the carbohydrate, they differ chemically. The ether extract sometimes includes, besides fat or oils, wax, chlorophyll, which are without feeding value, consequently, the food value of the ether extract is dependent upon its source. That obtained from oil cakes, grains, and their offals, give a higher value than that obtained from hays or green fodders. The digestible portion of the ether extract serves the same function as the carbohydrate, but its capacity for heat production is much greater, pure fat having two and a half times the value of carbohydrate. The crude fat or ether extract of oil cakes, grain, bran, &c., possesses a capacity for heat production two and two-fifths times greater than carbohydrate, whereas the fat estimation of hays and green fodders is only about twice the value of carbohydrate.

Nutritive Ratio.

The nutritive ratio, or N.R., of any food means the ratio of the protein content to the carbohydrate and ether extract combined; the ether extract is reduced to its starch equivalent. The nutritive ratio of any food, or combination of foods, is a most important factor in determining its efficiency.

Milking cows yielding up to 3½ gallons daily are most economically fed on a ratio with a N.R. of 1 to 6 or 7, which is the ratio of good mixed pasture grass; but for heavy milkers yielding 4 gallons and over, the ratio may be effectively reduced to 1 to 5, which means that for each part of digestible protein, there are 6, 7, or 5 parts of carbohydrate respectively.

In practice, the N.R. of any ration is valuable when purchased foods are used, because it shows in what proportions the constituents should be combined to produce the best return. Both money and feed may be wasted by disregarding its value. When the N.R. is too wide, the food is deficient in protein, and consequently not sufficient protein is ingested to meet the needs of the animal, whilst at the same time the digestibilit

of the food is depressed. Maize (green) is an example of a food with a wide ratio, there being 1 part of protein to 12 of carbohydrates. When the ratio is too narrow, protein is wasted, because the amount of food consumed under general conditions contains a greater amount of protein than the animal can utilize.

An average milking herd requires food possessing an average ratio of 1 to 6 and 1 to 7. When the amount of carbohydrate is greater, the ratio is wide; when less, narrow.

Examples of foods, with their ratios:—

Wide N.R.		Narrow N.R.	
Green maize ...	1 : 12.	Green lucerne ...	1 : 3.
Oaten hay ...	1 : 11.	Bran	1 : 4.
Oaten straw ...	1 : 46.	Linseed meal ...	1 : 2.
Potatoes ...	1 : 18.	Brewers' grain ...	1 : 3.

The use of any of these foods alone results in considerable waste, and is not conductive to an economical return; but a combination of the above foods provides, not only the necessary food substances, but contains them in that proportion which produces the most economical return.

Balanced Ration.

A combination of foods in that proportion which gives the best results for any particular purpose. Some of the above-mentioned foods, when combined in the following proportion, form a balanced ration for an average milking herd:—

Maize ..	40	Bran	4	Chaff	10	Lucerne Hay ..	12
Bran ..	10	Green Lucerne ..	15	Linseed Meal ..	1	Maize.. ..	50
Chaff ..	5	Maize	40	Brewers' Grain ..	20	Bran	10

The amounts fed are determined by the quantities of milk secreted. It must not be inferred that, when some of the above feeds are fed alone, good returns are not attained, but a combination increases the yield, and at the same time decreases the cost of production when market values are given to home-grown crops, or when purchasing.

Concentrates.

A term applied to foodstuffs relatively rich in easily digestible food substances, as oil cakes, grains, bran, and mill products. Lucerne hay—although popularly regarded as such—is not a concentrate in the above definition, owing to the high cost of digestion. It should be used as a bulky feed, and, when farm-grown, should be provided in large quantities.

Maintenance Ration.

That amount of food required to maintain a non-producing animal in a healthy condition.

In any system of feeding, the first demand is made for maintenance; what is available over this requirement can be used for work or milk production. In feeding milking cows, the maintenance part of the ration is most cheaply supplied by bulky foods, such as hays, and green fodder. That part to be used for milk secretion is best provided by easily digestible concentrates.

Digestible Nutrients.

For the purpose of determining the relative food values of foodstuffs, each is analyzed to determine the percentages of protein, carbohydrate, and crude fat or ether extract. This process gives the total amounts present, but does not indicate the food value of the substance.

To ascertain its nutritive properties, the palatability and digestibility are determined by feeding it either alone or in combination with other foods of known value and digestibility, for a period of several days, to animals—in this case, to cows. The manure is carefully collected, weighed, and analyzed, and the difference between that contained in the original food and manure represents what has been digested and is available for the animal's use.

DIGESTIBILITY OF SILAGE.

With regard to the question of the digestibility of silage against that of the original crop from which it is produced, it is generally recognised, according to a note by Messrs. Guthrie and Ramsay in the Government agricultural publication of New South Wales, that it is about the same as that of dried fodder (hay), both silage and hay being slightly less digestible than the original green fodder. This low digestibility is not due to any actual decrease of indigestible material, but to the fact that there is always a considerable loss in the conversion of the green crop into hay or silage (apart from the loss of water), and that this loss chiefly consists of sugar and similar soluble substances which are wholly digestible. A loss of as high as 20 per cent. of material is possible in the conversion of green crop into silage, and the material so lost is for the most part the digestible portion of the fodder. On the whole, there is less loss of material when the crop is converted into silage than in the case of field-cured crops, and the silage, if properly prepared, is much more succulent and palatable to stock. If the fodder in drying is exposed to rain, a very considerable loss of material results; whereas in the conversion into silage, such conditions can be avoided.—*Auckland Weekly News*, 24th February, 1916.

RADIUM AS A FERTILIZER.

For the past two years experiments have been instituted at Reading, England, to investigate the power of radium as a fertilizer. As a result of the above experiments it is made clear that while in some cases plants dressed with radio-active ore have given better results than the control plants, the improvement has not been of such a nature as to warrant the assumption that so expensive a commodity as radium could be profitably applied to crops. Accepting these investigations as conclusive, the farmer and gardener, says the *Times*, need look for no material benefit from radium.

The chief result has been to emphasize the value of farmyard manures and artificial fertilizers.—Extract from current Industrial News. *Journal of Ind. and Eng. Chem.*, December, 1915.

TREE-PLANTING COMPETITION.

In 1912, a tree-planting competition was arranged by authority of the Cabinet, acting on proposals submitted by the Lands Department. For the working out of the details of the scheme, a special committee was constituted, comprising the horticultural representatives of the *Australasian, Leader,* and *Weekly Times* papers, the Secretary for Lands, the Conservator of Forests, and the Curator of the Botanic Gardens. The State was divided into five large divisions, having regard to physical and climatic conditions, and two further divisions—"small holdings dry" and "small holdings irrigated."

For each of the first five divisions, the prizes offered were—1st, £60; 2nd, £25; 3rd, £15; and 1st, £25; 2nd, £15; and 3rd, £10, for each of the two small holdings; a gold medal being awarded to every winner of a first prize. Very wide publicity was given to the scheme, through the generous help rendered by the entire press of the State, the full details being published and given great prominence. The total number of entries accepted was 111, being fewer than were expected. A very complete list of trees suitable to the various divisions, and classified according to their value for (*a*) shelter, shade, and wind-breaks; (*b*) timber supply; (*c*) ornamental and other purposes, was compiled by the Committee and freely circulated. The period over which the competition extended was three years.

At the end of the first year, all competitors were asked by circular letter for a report, and it was then found that, as a result of the unfavorable season of 1912-13, a good many of the attempts had not given satisfactory results, and a number of the competitors withdrew. The withdrawals included all those who had entered for competition in Division 1, "Mallee Country," and Division 5, "Hill Country." A review of the work of the remaining growers—five divisions—has now been completed by Mr. J. Cronin (Director of Botanic Gardens). His report shows that a greater measure of success has attended the project than is actually revealed by the prize plantations. Failure, in some cases, inspired renewed effort, and a measure of experimentation. It is considered by the Committee that valuable object-lessons are now provided in the widely-distributed localities, and that tree-planting, as an aid to settlement, will be encouraged thereby. There are evidences throughout the State of increasing interest in this good work, to which the tree-planting competition has materially contributed, and it is being further assisted by the Arbor Day celebrations.

Mr. Cronin reports:—"As a result of my investigations, I place the competitors in the following order:—

DIVISION 2.

A. Holland	Avon Plains	1
W. Cornish	Lake Boga	2
E. Newnham	Nagambie	3

DIVISION 3.

J. W. Grubb	Traralgon	1
C. C. Rossiter	Hedley	2
S. N. Francis	Coleraine	3

DIVISION 4.

E. Bell, Jun. ..	Mockinya	.. 1
J. Bosisto & Co. ..	Emerald	.. 2

DIVISION 6.

Mrs. M. Tredrea ..	Cooma	. 1
T. Lee Bake ..	Swan Hill	.. 2
D. J. Corboy ..	Shepparton	.. 3

DIVISION 7.

E. C. Pettett ..	Glenorchy	.. 1
Mrs. E. Tehan ..	Millgrove	.. 2
S. Matchett ..	Iona ..	.. 3

I consider that the competitors named should be awarded the prizes offered by the Government, and that in each case the plantation is worthy of the prize recommended."

This report has been adopted by the Committee, and the prizes awarded accordingly.

(Signed) JOSEPH HARRIS.
JNO. CALLANDER.
D. M. DOW.
J. M. REED.
H. MACKAY.
J. CRONIN.

Mr. Cronin further reports:—

"The plantations inspected were situated in widely different parts of the State, including Coleraine, Skipton, Horsham, Avon Plains, Swan Hill, Shepparton, Cooma, Welshpool, Traralgon, &c., and, as might be expected, most of them were situated at some distance from the towns. The soils and climatic conditions were also widely different in character. In forming their plantations, the owners had generally accepted the lessons of earlier plantings, and had used the 'Sugar Gum' and 'Monterey Pine' very liberally for the purpose. Outside of these, the range on the whole was fairly wide, a few trees of several genera and species being selected, in some cases as an experiment, in others to afford some variety and ornamental effect. The most conspicuous failure was the 'Monterey Cypress' (*Cupressus macrocarpa*) and its varieties, a result probably largely due to drought, but in more than one case traceable to the trees having been planted in holes dug into the subsoil. In every case where this was done the trees of all kinds were comparative failures, and a similar result followed planting in low, undrained situations. The best trees were always found in high and well-drained places, where the initial cultivation was shallow but thorough. In most places these trees are now quite safe, except in case of fire. The plantations visited were all fenced, and in most places the young trees had been attended to in the matters of training, cultivation, &c. In only one case was evidence given of the use of manure. Some trees of *Eucalyptus calophylla* were so large that I expressed doubt as to their age. The owner proved that the trees were planted in 1912, but stated that he had manured them, giving each a handful of gypsum at planting.

A brief note respecting the nature of the plantations of the successful competitors may be of interest.

A. Holland, 1st in Division 2, has planted twelve plantations of 'sugar gums' and one of 'pepper trees' around a small water reserve and at his house at Avon Plains, 20 miles from St. Arnaud. These trees have all made fine growth, and are quite a feature in a bare, treeless district. Pines and other trees had been previously planted, but entirely failed to grow. The plantations total 15 acres, and the gums are about 15 feet in height. (It is stated that the sugar gums were first planted in this portion of Victoria in 1885 by the late John Crewar, who obtained the seeds from the South Australian Government. The plants from these seeds are still thriving, and are very fine specimens.)

J. W. Grubb, Traralgon, 1st in Division 3.—The plantations consist of lines around various paddocks, a patch of about 3 acres for timber, and specimens for ornament and shelter. *Pinus insignis* and *P. canariensis* have been planted about 30 feet apart on the boundary lines, with *Eucalyptus botryoides* midway between. The pines have made fine growth, but the gums have suffered from insect attacks. They are all growing, and may do well now. The timber patch is planted with pines, sycamores, peppermints, and box, set out 6 feet apart. The specimen and ornamental trees are very different in character and are doing well.

C. C. Rossiter, Hedley, 2nd in Division 3.—The property of this competitor was a dense tea-tree swamp eight years ago. It is now all drained and cleared, except for a few patches of the tea-tree left for stock shelter, but these are steadily dying out. The owner planted *Pinus insignis* about seven years ago, and a fine shelter belt now exists. A new plantation of 8 acres was formed for the competition, and *Pinus insignis* was liberally planted. These trees are all thriving. *Cupressus macrocarpa*, too, is doing fairly well here, but eucalypts of various species have been tried and have failed. Acacias and a few oaks are growing satisfactorily. A short hedge of about 100 feet of 'Murray Pine,' *Callitris rhomboidea* (*cupressiformis*), is most satisfactory, and forms, without any trimming, a dense screen about 7 feet high and beautiful in its deep green colouring. The pine and other trees have all been pruned to a clean stem to allow of sheep being placed in the enclosures to feed off the grass as a protective measure against fire.

E. Bell, Jun., 1st in Division 4.—The place is situated at Mockinya, about 25 miles from Horsham, where some 20 acres of sandy land have been planted, principally with black wattles and sugar gums. Although there was no great variety of plants here, they had been carefully cultivated, and were all in good condition.

Mrs. M. Tredea, 1st in Division 6.—A small farm situated at Cooma, about 13 miles from Tatura, and placed in the section for 'small holdings irrigated.' Gums of several kinds have been planted in lines around various small paddocks. *Pinus insignis*, willows along the channels and in a slight depression, and acacias of many species have also been planted, together with a wide selection of other trees. This is a most satisfactory plantation, and would be difficult to surpass. The whole of the trees have made excellent growth, have been properly attended to, and have been planted with good judgment.

E. C. Pettett, 1st in Division 7.—This competitor owns a small farm of 40 acres at Warra Warra, about 8 miles from Glenorchy. He is an apiarist, and has planted trees for the competition that produce pollen and honey for his bees. Hitherto he has been compelled to move his bee-hives as pollen or honey became scarce, but says that now he can depend on a supply of both from his plantings. The plantation acts as a breakwind and shelter, and is decidedly ornamental also. Gums of various species, *E. Calophylla, ficifolia, cornuta, corynocalyx,* &c., have all made very fine growth, as indeed have all the trees on the place. Acacias of several kinds are thriving equally with the eucalypts, viz., *A. decurrens, A. normalis, A. Baileyana, A. cultriformis,* and others doing well, but the severe frost experienced at times is too much for *Acacia elata,* which has been cut back repeatedly. Tagosaste, broom, and other bee-feeding plants have also grown well.

I have to say, in conclusion, that the arrangement of the competitors in the various divisions was made with a thorough knowledge of the conditions of the various parts of the State. After fully considering the matter on the ground, I know of no single instance where a competitor should have been placed in a different division to that allotted to him or her."

Tree List for the various Divisions, as prepared by the Committee.

Divisions 1 and 2.

MALLEE COUNTRY AND DRY NORTHERN COUNTRY.

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Currajong Tree (*Sterculia diversifolia*).
Bull Oak (*Casuarina glauca*).
Black Box (*Eucalyptus bicolor*).
Sugar Gum (*Eucalyptus corynocalyx*).
White Ironbark (*Eucalyptus leucoxylon.*)
Red Ironbark (*Eucalyptus sideroxylon.*)
Silky Oak (*Grevillea robusta*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Olive (*Olea Europœa*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Locust Tree (*Robinia pseudacacia*).
Pepper Tree (*Schinus Molle*).

Timber.

AUSTRALIAN TREES.

Bull Oak (*Casaurina glauca*).
Black Box (*Eucalyptus bicolor*).
Sugar Gum (*Eucalyptus corynocalyx*).
White Ironbark (*Eucalyptus leucoxylon*).
Red Ironbark (*Eucalyptus sideroxylon*).
Silky Oak (*Grevillea robusta*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Monterey Pine (*Pinus insignis*).

Ornamental or other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Cedar Wattle (*Acacia elata*).
Golden-rain Wattle (*Acacia prominens*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Box Elder or Manitoba Maple (*Acer negundo*).
Oleander (*Neriums*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).

Division 3.

SOUTHERN COUNTRY (COASTAL, PLAIN, AND UPLAND).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Gippsland Mahogany (*Eucalyptus botryoides*).
Yate (*Eucalyptus cornuta*).
Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Coastal Tea Tree (*Leptospermum lævigatum*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Olive (*Olea Europœa*).
Canary Island Pine (*Pinus Canariensis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Pepper Tree (*Schinus Molle*).

Timber.

AUSTRALIAN TREES.

Sugar Gum (*Eucalyptus corynocalyx*).
Yate (*Eucalyptus cornuta*).
Yellow Box (*Eucalyptus melliodora*).
Red Ironbark (*Eucalyptus sideroxylon*).
Forest Red Gum (*Eucalyptus tereticornis*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
Acacia longifolia, var. *sophoræ*.*
Golden Wattle (*Acacia pycnantha*).
Willow Wattle (*Acacia saligna*).
Norfolk Island Pine (*Araucaria excelsa*).
West Australian Red Gum (*Eucalyptus calophylla*).
Scarlet Flowering Gum (*Eucalyptus ficifolia*).
Eugenias of sorts.
Victorian Laurel (*Pittosporum undulatum*).
New South Wales Brush Box (*Tristania conferta*).

EXOTIC TREES.

White Mulberry (*Morus alba*).
New Zealand Flax (*Phormium tenax*).
Tamariska of sorts.
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Lime or Linden Tree (*Tilia Europœa*).

Division 4.

HILL COUNTRY (NOT HEAVY FOREST).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Peppermint Gum (*Eucalyptus amygdalina*).
Gippsland Mahogany (*Eucalyptus botryoides*).
Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Red Box (*Eucalyptus polyanthemos*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Lambert's Spreading Cypress (*Cupressus Lambertiana*, var. *horizontalis*).
Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Canary Island Pine (*Pinus Canariensis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Yellow Pine (*Pinus ponderosa*).
Mammoth Tree (*Sequoia gigantea*).

Timber.

AUSTRALIAN TREES.

Blackwood (*Acacia melanoxylon*).
Sugar Gum (*Eucalyptus corynocalyx*).
Blue Gum (*Eucalyptus globulus*).
New South Wales Blackbutt (*Eucalyptus pilularis*).
Forest Red Gum (*Eucalyptus tereticornis*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).
European Ash (*Fraxinus excelsior*).

* Particularly suitable as a sand-stay.

Ornamental and other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
West Australian Red Gum (*Eucalyptus calophylla*).
Scarlet Flowering Gum (*Eucalyptus ficifolia*).
Red Flowering White Ironbark (*Eucalyptus leucoxylon*, var. *rosea*).

EXOTIC TREES.

Sweet Chestnut (*Castanea sativa*).
Common Walnut (*Juglans regia*).
Bead Tree or White Cedar (*Melia Azedarach*).
New Zealand Flax (*Phormium tenax*).
Pin Oak (*Quercus palustris*).
White Oak (*Quercus alba*).
Portugal Oak (*Quercus lusitanica*).
Lime or Linden Tree (*Tilia Europæa*).
English Elm (*Ulmus campestris*).
American White Elm (*Ulmus Americana*).
White Mulberry (*Morus alba*).

Division 5.

HILL COUNTRY (FORMERLY FOREST, MORE OR LESS CLEARED AND OLD TIMBER KILLED).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Apple Tree (*Angophora intermedia*).
Satin Box (*Eriostemon squameus*).
Sugar Gum (*Eucalyptus corynocalyx*).
Gippsland Mahogany (*Eucalyptus botryoides*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Yellow Pine (*Pinus ponderosa*).

Timber.

AUSTRALIAN TREES.

Blackwood (*Acacia melanoxylon*).
Mountain Ash (*Eucalyptus amygdalina-regnans*).
Blue Gum (*Eucalyptus globulus*).
Yellow Stringy Bark (*Eucalyptus Muelleriana*).
Messmate (*Eucalyptus obliqua*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

AUSTRALIAN TREES

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
Golden-rain Wattle (*Acacia prominens*).
West Australian Red Gum (*Eucalyptus calophylla*.)
Scarlet Flowering Gum (*Eucalyptus ficifolia*)

EXOTIC TREES.

Sweet Chestnut (*Castanea sativa*).
Cape Chestnut (*Calodendron capense*).
White Mulberry (*Morus alba*).
New Zealand Flax (*Phormium tenax*).
Pin Oak (*Quercus palustris*).
Portugal Oak (*Quercus lusitanica*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Lime or Linden Tree (*Tilia Europæa*).

Divisions 6 and 7.

SMALL HOLDINGS.

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Gums (*Eucalypts*) of kinds, according to locality (*vide* other lists).

EXOTIC TREES.

Monterey Pine (*Pinus insignis*).
Monterey Cypress (*Cupressus macrocarpa*).
Olive (*Olea Europæa*).
Loquat (*Eriobotrya Japonica*).
Pepper Tree (*Schinus Molle*).
Victorian Laurel (*Pittosporum undulatum*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Wattles (*Acacias*) of kinds, according to locality (*vide* other lists).

EXOTIC TREES.

Walnut (*Juglans regia*). Bead Tree (*Melia Azedarach*).
Camphor Tree (*Cinnammomum Camphora*). New Zealand Flax (*Phormium tenax*).

PROPAGATION METHODS.

Every settler should have a small plot for the raising of his own trees. The following are some general methods which may be adopted for the sowing of tree seeds, viz.:—

1. *Indiscriminate or Broadcast Sowing.*—

(*a*) The area where the seed is to be sown should be in such a condition that the seed, when scattered, will find a ready lodgment either in the soil or in decaying vegetable matter suitable for inducing germination, and providing the necessary light, moisture, and nourishment for the future plants to establish themselves.

(*b*) The area may be scarified or ploughed and harrowed, being worked to a fine tilth, before sowing, if its natural condition is not suited for the reception of the seed.

Sugar Gum Plantation, 2¼ Years Old.

2. *Sowing Seeds in Drills.*—

If necessary, the plough or a drilling machine may be run lightly along the lines where the seed is desired to be sown. This will allow light and moisture to penetrate the drills and stimulate the germination of the seeds.

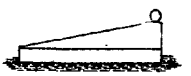
After sowing the seeds, they may be lightly covered with some friable soil, or the rake may be very lightly drawn along the drills, with the object of covering the seeds, which may then be gently pressed down with the foot.

3. *Seed Sowing in Prepared Open Beds or Shaded Frames.*—

The beds should be formed in some slightly sheltered position. The soil should be of two-thirds peaty or sandy nature and one-third of good loamy character. After thorough preparation and levelling of the beds, the seeds may be sown and lightly covered with fine soil and carefully hand-watered with can. When the seedling plants have developed, care must be taken not to allow them to become either too dry or over moistened.

It is sometimes an advantage to have the beds formed in frames or framed around thus:—

Front View.



End View.

so as to allow of calico-shading being rolled up or down, in order to provide for the protection of beds during unfavorable weather.

4. *Seed Sowing in Pots, Pans, or Flat Boxes.*—

The receptacles should be well drained. Use similar soil and exercise the same care as in the case of seed sowing in open beds.

Note.—In all cases of seed-sowing, the general practice may be adopted of covering the seeds with suitable soil to a depth corresponding to the size of the seeds.

Sugar Gums and Pepper Trees at Mildura—12 Years after Planting.

SOWING OF PINE SEEDS.

The ground should be well dug, lined out in 4 or 5 ft. beds, and then raked to a fine surface. The pine seeds should be soaked in cold water, and allowed to swell. The water should then be drained off, and the

seed placed under cover for a few hours. Drill lightly the beds in three or four lines, and sow the seed straight away in the drilled lines, and cover up with the back of a light rake. If the soil is dry, water well with watering can and fine rose, and keep the ground moderately moist. In ten or eleven months' time the seedling plants should be lifted, and transplanted in nursery lines, 3 to 4 in. apart and from 14 to 18 in. between the rows. In this position they can remain for one or two years. They will then be large enough to remove to their permanent quarters.

The sowing should be done during August and September, but this depends on the season and district, the northern areas being first planted. In 1 lb. weight of pine seed there are from 19,000 to 90,000 seeds.

THE RAISING OF GUMS.

Sowing in Beds and Boxes.—The seed can be sown from September to November, in open beds, boxes, pots, or pans. If in open beds, in the

Pine Trees and Gums, Titanga Estate, Lismore—18 years after planting.

absence of a cement bottom something in the shape of hardwood boards or sheet-iron should be laid 7 or 8 in. below the surface to prevent the roots of the seedling gums from going down. The seed beds should be from 3 to 4 ft. wide, with a fine smooth surface. Water the bed before sowing. Sow broadcast, and spread some finely sifted loamy soil, light and dry, with a little decayed leaf mould mixed lightly and evenly over the seed; then water with a fine rose. A temporary screen over the beds will assist the seed and protect the plants.

If boxes are used they should be from 4 to 6 in. deep, with holes in the bottom for drainage. When filling the boxes, pots, or pans, place over the holes (for open drainage purposes) curved pieces of crocks or charcoal. Fill in with moderately-sifted loamy soil to within 1½ in. of the top; water, sow, and cover the seed as directed for the open beds. As plants in boxes are liable to be drawn, great care must be taken to

keep them exposed to the light, and only shade when required. The seed will cost from 1s. 6d. to 2s. 6d. per ounce.

Sowing in Belts.—Where this can be done it is the cheapest and best. In rangy country, where there are steep slopes thickly dotted with tree stumps and outcrops of rock, and the surface is a tangle of roots, nursery growth must be planted. Where the soil is free from obstacles of this kind, seed planting can be proceeded with. The nature of the surface and subsoil should be understood, as on this will depend the depth of the ploughing. A good shallow surface must not be buried or mixed out of proportion with a stiff clay subsoil, that will run together in wet weather, and bake into a hard crust in summer. If the subsoil is free, open, and porous, plough deeply, and work it up to a fine tilth.

Mix the gum seed with dry sandy loam, well sifted, and sow by hand broadcast out of a dish, seed bag, or box. Then pass a light harrow over it. This done, the success of the crop will depend on the season. For this work May, August, and September months are the best. On the climate and district will depend the month selected for the work. As the trees advance in growth thin out, and allow them growing space. A mixed sowing should not be done unless the cultivator understands the nature and habit of the trees he is about to mix.

Fence off with a temporary dropper fence. The seed, cultivation, and fence will cost from £2 5s. to £3 5s. per acre, that is, when the planting is done along a permanent boundary fence.

PREPARING THE GROUND AND PLANTING.

Take out square holes 12 x 12 or 24 x 24 in. wide, and the same in depth; place the surface soil on one side of the hole, and the subsoil on the other. For shelter planting on exposed sites the holes should be 8 ft. apart; thin out as the trees grow. When the soil is pulverized, and not too wet or too dry, and the holes free of water, fill in by placing the soil as it was taken out. Should the subsoil be poor, mix a little surface soil with it. For planting select dull weather. Dry winds are injurious to plants out of the ground; avoid removing them. For planting it is better that two persons should be employed at the work. When root space is made in the centre of the filled-in hole by one man, the other can place the tree in its position from beneath a cover, and steady it while the fine earth is being filled in and pressed gently round.

Pines, cypresses, &c., should be planted out in June or July, and not later than August. In warm districts, where frosts are not severe, gums (if properly hardened off) can also be planted. They will then be well established before the hot weather sets in. In cool districts, where frosts are severe, gums should not be set out until all danger is past. In lifting the gums for transplanting, great care must be taken not to injure or expose the roots. Allow as much earth as possible to remain on the roots; on gums every root is required. If reduced when transplanted into a new soil and position, the remaining roots will be unable to supply the stem and foliage with sufficient moisture. Hence, so many deaths, through the moisture passing away from the stem growth faster than the roots can supply the sap waste. Gums should be planted out in their permanent place when young and small, say, from four to twelve months old.

Great care should be taken to exclude all stock from the plantations. As rabbits do great injury to many of the seedling trees and plants wire netted fences will be a necessity in most localities.

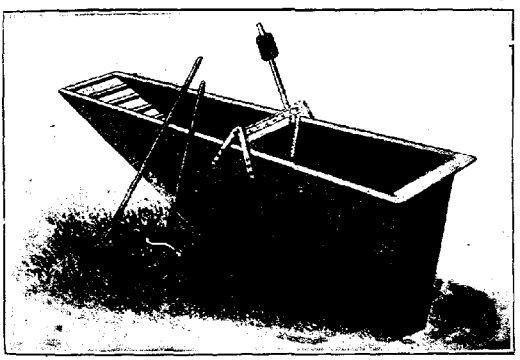
SHEEP DIPS.

By A. W. Curlewis, Inspector of Stock.

The following particulars and plans of a few sheep dips which have given satisfaction to those using them may be of interest to sheep-owners and others intending to construct dips this year:—

No. 1.—For small flocks only.—This is a portable iron dip used at Longerenong College, among other places, and described in a former issue of the *Journal* by Mr. G. A. Sinclair, Principal of the College, as under:—

"The plan adopted at this institution is for small flocks only, and about 800 sheep per day can be put through comfortably and thoroughly. We are indebted to a well-known Tasmanian sheep breeder, Mr. F. Burbury, of Ashgrove, for the general idea of the yards, and the details worked out here may be useful to many at this juncture. Experience has shown that there are objections to the usual style of dipping yards with a long race often leading upwards and thus entailing much

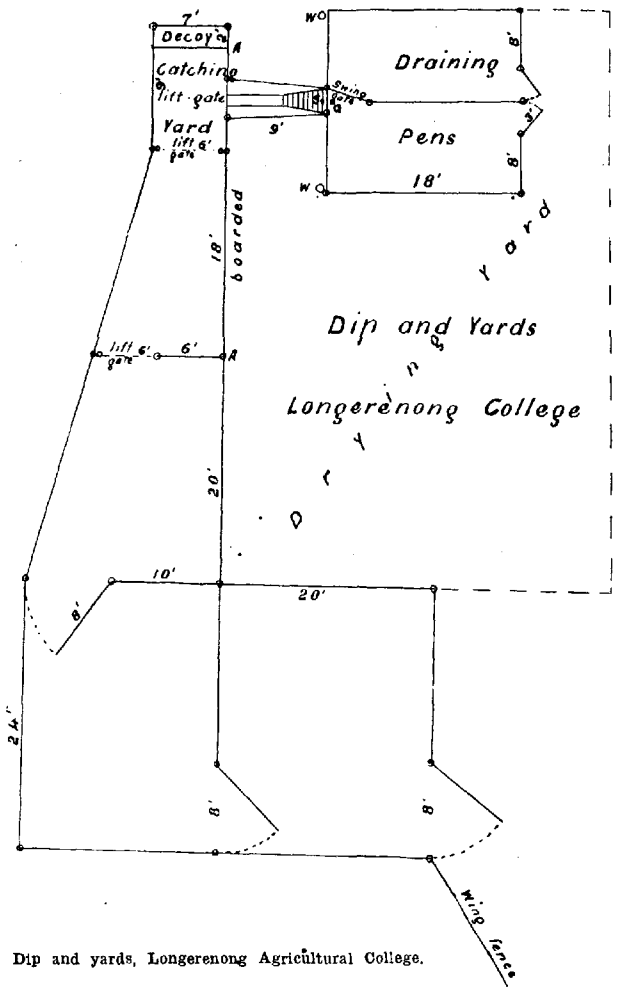


No. 1.—Dipping bath for small flocks.

handling and bruising of sheep, ending in a sudden drop into the dip, and a long climb out at the other end. These are well known to most farmers; and the aim in this plan was to avoid these drawbacks as much as possible.

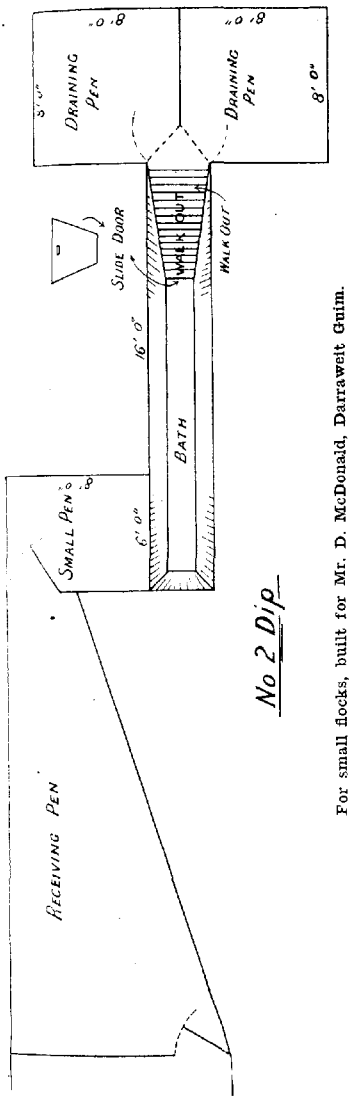
"The galvanized iron dip used cost £7 15s. in Melbourne, and was built there by a local manufacturer. The whole of the work is on one general level. The floor of the draining pens has a fall of 1 inch from the centre to each side, where a drain catches the liquid dripping from the sheep and runs it into two wells (w.w), each drain having a fall of 2 inches from back to front. The liquid is pumped from the wells back into the dip with a Californian pump made by a local plumber. The bottom of the pump is closed and perforated to keep out any dirt. When ordering the bath it would be advisable to stipulate for a curved pipe to be put in at the end near the top at s which should lead to a shallow opening at G, covered with a grating. If the drains are led to this, the liquid draining off the sheep will run back to the bath by gravitation. The pipe should be 3 inches in diameter.

"In the catching yard and draining yards the soil was excavated to a depth of 15 inches. Sand was then put in to a height of 1 foot, and a floor of bricks in cement made on top. The yards cost more with us than



Dip and yards, Longerenong Agricultural College.

they would in a district where good splitting timber is available. All the timber had to be purchased; and, with the exception of the posts, which



For small flocks, built for Mr. D. McDonald, Darraweit Guim.

were old railway sleepers, sawn timber was used. The fences are about 3 ft. 6 in. high, boarded with four 6-in. x 1-in. hardwood boards, six boards being used from A to A on plan to prevent the sheep seeing the dip. The posts are about 6 feet apart, and 2 feet in the ground. A hurdle is placed across the front of the decoy pen, so that the sheep in it can be plainly seen by the flock. The draining pens will each hold about 40 crossbred sheep, and the yards and catching pens about 400 to 500 sheep. The price of the timber will vary so considerably with the district, that it is of little use to give the cost of the yards.

"To protect the bath, and to obviate the necessity of removing it each year, we built a wooden framework around the outside, between it and the earth, both the bath and the framework being tarred. A check gate is provided with the bath, to prevent the sheep going through too quickly; but we found that many of them jumped well out and the bar of the gate caught them under the neck, so the check gate was removed. The sheep can easily be kept in the liquid by means of the crutch without injuring them. To prevent splash, a good plan is to put a 6-in. x 1-in. board along each side of the bath on its flat and projecting an inch or two over the bath. This can be fastened down to the sill under the rim of the bath, or to blocks driven into the ground."

No. 2.—This is also for dealing with small flocks, but is of substantial construction, built for Mr. D. McDonald for use on his property at Darraweit Guim.

Dimensions of Bath.—Length at top, 16 feet; length on floor, to foot of ramp or "walk-out," 9 feet; width, inside measurement, 3 ft. 9 in. at top, 1 ft. 3 in. at bottom; depth, 5 feet.

No slide was made, the sheep being put in by hand from a small pen alongside bath.

There is a sliding door at the foot of ramp to keep the sheep in as long as required.

Draining Yards.—Two are provided, each 8 feet x 8 feet, with swing-gate hung on end of dividing fence to enable yards to be used alternately.

Material.—Concrete mixed in proportion of seven parts gravel to one of cement. Walls and floor of bath are 5 inches in thickness, faced by ½ inch of cement mortar, four of sand to one of cement. Floor of ramp is faced with mortar, two to one sand and cement, and is formed in slats or corrugations to give a good foothold. Floor of draining yards is 6 inches in thickness, laid on good sand foundation, and faced with 1 inch cement mortar two in one, and formed with a slope of 3 inches in 8 feet towards dividing fence between yards, and also from back of yards towards bath.

Ten casks of cement and about 9 cubic yards of gravel were used in construction, and total cost was about £20, including labour.

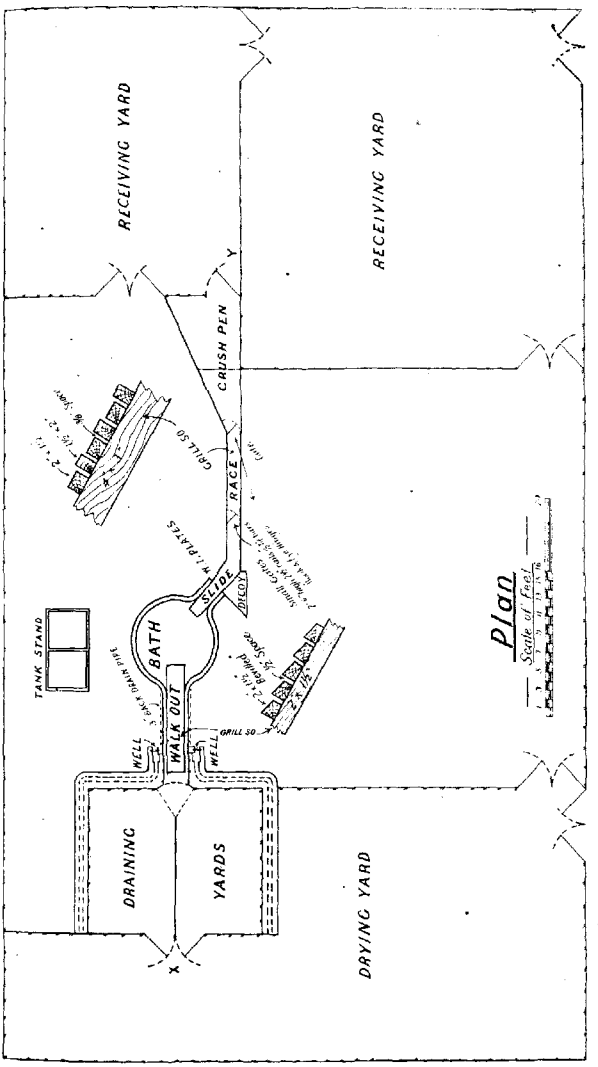
Since this dip was constructed, however, the price of cement has largely increased, and it would probably be better to substitute bricks for concrete, and grout with cement mortar.

No. 3.—Ballarat City Council Dip.—This is a circular bath dip, the sheep passing down a slide from the end of the race leading from receiving yards, fixed at an angle of 45 degrees to the race, with a drop of five in seven. There is a decoy pen at the end of race to hold two or three sheep. I saw some 400 young sheep put through in an hour under the direction of Mr. Cadden, the City Council's officer. They went well, and were thoroughly dipped.

The bath holds eight average-sized sheep at a time, and the last "block" of the race has the same capacity, so that whilst the sheep are soaking the race is refilled, and the loss of time is slight.

When a dip is required for comparatively small lots of sheep, a round bath is, in my opinion, preferred to a short rectangular one. In the former, the sheep may be kept swimming round as long as desired without any check, whereas in the latter they must be checked in order to give them the requisite time to soak, and they are either kept floundering about or turned back; in the latter case they meet sheep swimming in the opposite direction, and a block occurs.

A circular bath such as the one under notice (and one of smaller dimensions might be made if desired) is also comparatively economical to fill, and may, therefore, be bailed and recharged when used for several lots of sheep, thus avoiding the use of foul wash. Its full capacity is 1,160 gallons. It may be used down to the 3-ft. mark for small sheep and lambs. This depth represents about 500 gallons of wash. It will be seen that, when refilled, the liquor is very much freshened, and the necessity of very frequent cleaning out is much reduced, hence cheaper work can be done for small lots.



No. 3.—Ballarat City Council's Dip.

Hereunder is a description and particulars of its construction, kindly supplied by Mr. Farrer, City Engineer, Ballarat:—

Dimensions of Bath.—Inside diameter, at top, 9 feet; inside diameter, at bottom, 4 feet; depth, 5 ft. 3 in., with a 12-ft. long ramp or "walk-out"; slope, one in three.

Draining Yards.—Two, each 16 feet x 10 feet, with slope towards gutter at outer edge, whence the liquid runs into small settling pits, one on each side, fitted with gully-well to catch grit and filth, and grating to strain off floating matter, hence only strained liquid gets back to bath.

The silt and thick liquor so checked is drained away by removing a wooden sluice-gate, which opens the pit to the bottom. When the dip is not in use, this sluice-gate is left out, so that rain water draining off the pens cannot get into the bath.

The constructive material is cement concrete, in proportion of six parts gravel to one of cement for the main part of the work. The inner sides of all walls and bottom are rendered to a thickness of ½ inch with two to one cement mortar, finished off with a coat of ¼ inch thick of one to one cement mortar.

The walls and floor of bath are both 6 inches in thickness.

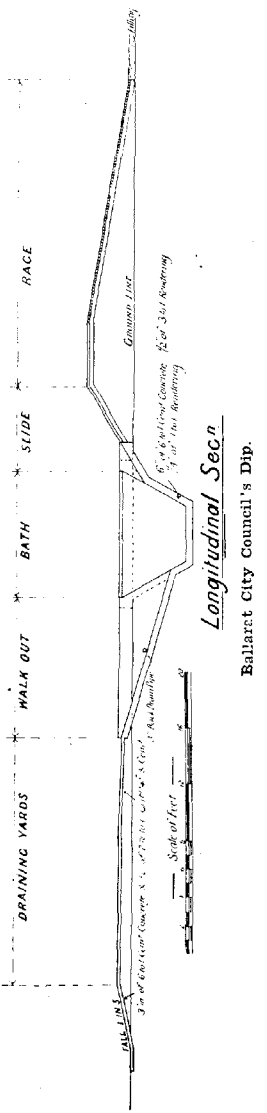
The floor of draining yards is 3 inches thick of six to one, as before, faced by ½ inch of two and a half to one grit and cement, and formed on good sand foundation.

"Slide-in" above bath top is of timber, lined on bottom with plain sheet iron, about ⅜ inch thick.

Hereunder is given the capacity of bath at different marks, as gauged by tank measurements:—

Mark at depth of—		
4 ft. 9 in.	... ...	1,160 gallons.
4 ft. 3 in.	... ...	949 ,,
4 feet	... ...	848 ,,
3 ft. 9 in.	... ...	757 ,,
3 ft. 6 in.	... ...	664 ,,
3 ft. 3 in.	... ...	571 ,,
3 feet	... ...	497 ,,

NOTE.—One hundred and sixty average-sized sheep will remove 100 gallons of



Longitudinal Sec^n

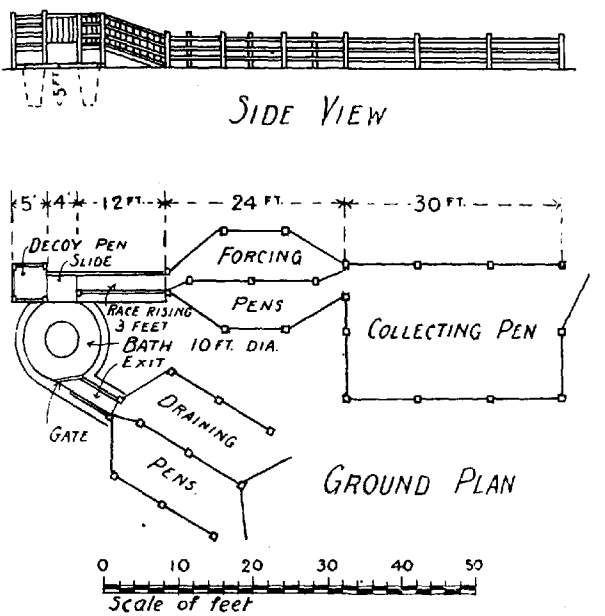
Ballarat City Council's Dip.

fluid from the bath, but a considerable portion of this will be returned if the animals are allowed sufficient time in the draining yards.

Approximate cost of bath and draining floor was £35 (in 1913).

Total cost, inclusive of fencing and gates for receiving, draining yards, and race, paving, two water tanks, and water service from main was about £126.

No. 4.—This is a dip shown on Departmental Farm Buildings Plan No. 7; it is of about same dimensions and style as that of No. 3, with the addition of a central pillar, which results in a saving of wash, and



No. 4.—Dip Circular bath with centre pillar.

is considered an improvement; it should tend to keep the sheep swimming round evenly, and regulate the uniformity of time each sheep remained in the bath.

Specifications regarding material, &c., are similar to those given for No. 3.

No. 5.—This is a dip suitable for large flocks, and is shown on Departmental Farm Buildings Plan No. 8. The bath provides for a swim of upwards of 30 feet, and the draining pens are well planned,

as are also the receiving and forcing yards. The sheep enter the bath by a slide leading straight from the end of race, and no decoy pen is provided for.

Specifications of material, &c., may be worked out from those given relative to No. 6.

No. 6.—Dip constructed by Mr. Wallace, at Drummartin Estate, near Elmore.

Material.—Brick grouted in cement, faced with cement mortar, three of sand to one of cement.

Dimensions.—Bath—length, 40 feet at top; 26 feet at bottom to the foot of ramp or "walk-out"; width, inside, 22 inches at top, 10 inches at bottom; depth, 5 feet at the back, 4 feet at foot of ramp.

Construction.—Walls of bath 4 inches, *i.e.*, one brick in thickness, with a pier or column of three bricks square built in each wall, 13 feet from the back end, to strengthen it; building iron is laid in every fourth course, and a good packing of clay or other solid material rammed in behind to support walls.

The wall at the back, and for 4 feet of side opposite the slide-in, is built 3 feet above the level of the ground. Along the top of the wall, all round, one brick is placed lengthways, at right angles, to form a coping. On the floor of bath the bricks are laid on edge on good sand foundation.

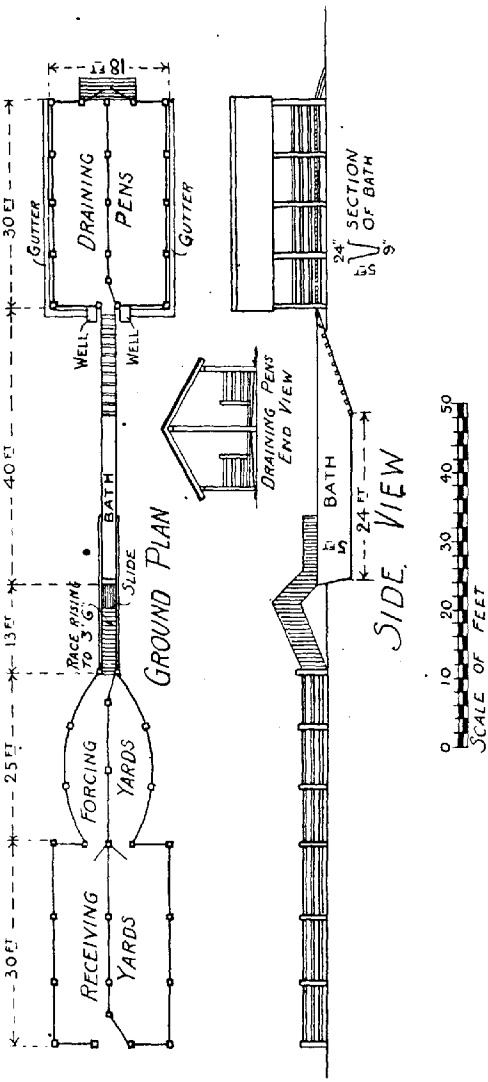
The ramp is faced, or overlaid, with 3 inches of cement mortar (three in one), and formed in slats or corrugations to give the sheep a good foothold in walking out; it is also widened slightly towards the top.

Draining Yards.—Two yards, each 20 feet x 20 feet, floor formed of bricks laid on edge on good sand foundation, grouted and faced with 1 inch of cement mortar, as before mentioned. The floor has a slope of 3 inches in 10 feet from the sides to the centre of each yard, and a slope from the back of the yards towards the bath of 1 inch in 10 feet. The liquid drains into two settling pits 2 feet in depth by 2 feet x 1 ft. 3 in., from which it runs through strainers placed at the entrance to channels near the top of the pits, and thence by pipes or channels under the surface to the bath, which it enters 8 feet from the "walk-out."

These pits can be frequently skimmed of droppings, pieces of wool, &c., and baled out when necessary, thus to an extent preventing the dip from becoming fouled.

A gate is hung on end of fence dividing the two yards, to fasten back to a post at either side of walk-out, and so that the yards may be used alternately.

Entrance to dip is by a race leading from receiving yards, 10 feet long, 1 ft. 3 in. in width, inside measurement, with slide 3 ft. 6 in. on the side of the end abutting bath. The slide, which is placed at an angle of about 45 degrees, is constructed of hardwood, and is kept well greased or wet when the sheep are going through.



No. 5.—Long swim dipping bath.

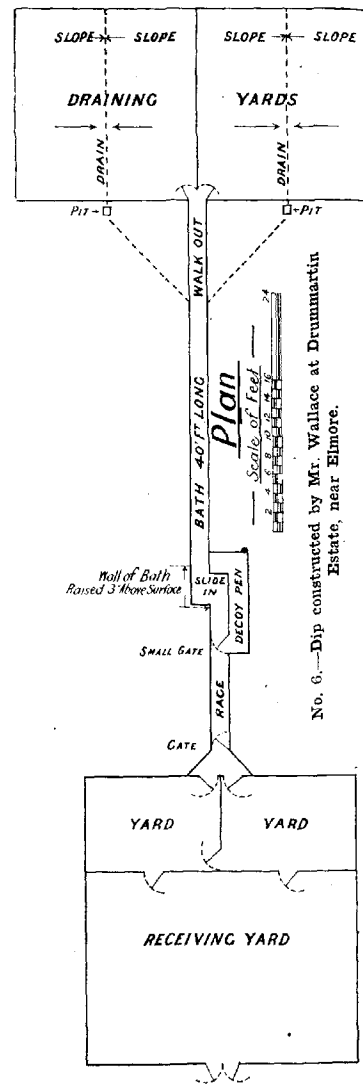
Half way along the race is a gate which opens into decoy pen, which in this dip extends along the forward part of the race and round the end of it to the back of the "slide-in." The fence between the race and this long decoy pen is fairly open, so that the sheep can readily see through it; the outer side of race, where the "yarders-up" work, is boarded up. The race is floored with hardwood, with a slight fall in the last panel to top of "slide-in," which really forms the end of race. Water is laid on, and the arrangements of this dip are complete and convenient, Mr. Wallace having, as far as possible, combined the good points of various dips he had inspected before having his own constructed.

I consider the draining system and style of decoy pen particularly good. The owner kindly supplied me with the following particulars *re* approximate cost, &c., and will, I feel sure, be pleased to give any sheep-owner further details if desired:—

Material used—

Bricks, 5,800 ...		
Cement, eight casks	£31*	
Posts, rails, &c. ...		
Labour		24*
Cartage		8
Total ...		£63

*Price of cement has increased, and probably cost of labour also, since the above estimate was given.



No. 6.—Dip constructed by Mr. Wallace at Drummartin Estate, near Elmore.

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(*Continued from page 317.*)

CASE MOTHS.

There are several species of stick-case insects, which attack vegetables, fruit, and fruit trees, and garden plants. Most of the damage is done by the insects before they are noticed. The perfect insects, in most cases, are small moths, the females being destitute of wings, and are rarely seen outside their stick-houses. The females bring forth their young in myriads; these latter escape in crowds, let themselves down, by a silk thread spun from the lower lip of the case, until they reach a twig or leaf; and then each immediately begins to construct a separate case of tough silk, the outside covered with particles of bark, &c., to protect it during the period of its larval existence. Tree-growers will have noticed little clusters of leaf-like substances, which are constantly on the move. If these be examined carefully, it will be seen that the moving objects are these insects in their early stages; and even when so small, it is surprising the amount of damage they do in a very short space of time. The orange case moth causes considerable damage to orange, lemon, quince trees, and vines. Several species of the "lictor, or faggot case moths," which appear at intervals in immense numbers, are very destructive to cypress hedges near Melbourne. Fortunately, these case moths are easily

Fig. 10.—Case Moths.
(*Metura elongata*, Saunders.)

destroyed by the arsenical sprays, Paris green, or arsenate of lead. The latter spray causes the hedges to look as if they had been whitewashed; but after the insects have been destroyed, which is about a day, the hedges should be hosed, and all traces of the spray will disappear.

THE VINE MOTH.

This is probably one of the commonest moths found in Victoria; it is recorded from every locality where vines are cultivated, and is one of the vignerons' greatest enemies. The moths deposit their eggs on the vine, and these soon hatch, and the young caterpillars at once commence to feed. The first brood generally appears in October, and after a few weeks enter the pupa state about the beginning of December, the moths emerging about the end of December. It will thus be seen how rapidly these insects increase. The larvæ, when newly-hatched, are of a dark greenish-black colour; but as they increase in size, the colouring becomes greenish-yellow. This moth is a native insect, but, unfortunately, is one that forsakes its native food for something which is no doubt easier eaten and more palatable. When vines, fuchsias, or Virginian creepers are attacked, spray with arsenate of lead. Another moth, the vine hawk moth, probably an introduction from Europe, is also destructive to our vines. Its larva is a formidable-looking creature, sometimes greenish in colour, and sometimes brown, measuring often 3 inches in length.

Fig. 11.—The Vine Moth.
(*Agarista glycine*, Lewin.)

TOMATO MOTH.

One of the worst pests of tomatoes is the tomato moth. It belongs to the cutworm moths (Agrotis, Heliothis, &c.). These caterpillars hide just under the soil in the day time, and at night come up and eat the tomatoes. At other times, the moths deposit their eggs on the tomatoes, and the young, as soon as they emerge, commence to bore into the tomato, and in a very short time the inside is eaten out. The caterpillars are about an inch long, of a dirty, brownish colour. They are usually curled up just under the soil. The female moths hide in the day time under wood, old bags, weeds, &c., and in the evening fly about

from plant to plant depositing their eggs. Poisoned baits can be used, which are made as follows:—Bran, 10 lbs.; molasses, 4 lbs.; Paris green, 4 ozs. The whole is to be made into a paste or dough, and placed, in small pieces about the size of a nut, amongst the tomato plants; this will destroy cutworms wholesale. The tomatoes themselves should be sprayed with arsenate of lead, but should be washed before using.

CUTWORMS.

These moths, which are found in countless thousands in all parts of Victoria, are known as "Bogong," and "Take-all" moths. The caterpillars not only destroy wheat and other grain crops, but attack vegetable and garden plants, especially carnations, dahlias, and rose buds. One species, *Agrotis munda*, "the Bogong moth," was regarded as a great delicacy by the Aborigines, and annual trips to the Bogong and other ranges were taken, where the moths could be obtained in thousands. The Bogong moths crowd on the surfaces, and also in the crevices of granite rocks in incredible quantities; to procure them with greater facility, the natives used to make smothered fires underneath these rocks, and about them the moths collected, and were suffocated with the smoke. After they had collected a large quantity, the blacks proceeded to prepare them. According to various authorities, the following procedure was observed:—A circular place was cleared upon the ground, of a size proportional to the number of insects to be prepared: on it a fire was lighted and kept burning until the ground was considered to be sufficiently heated, when the fire was removed, and the ashes cleared away. The moths were placed upon the heated ground, and stirred about until the down and wings were removed. They were then placed upon pieces of bark, and winnowed to separate the dust and wings from the bodies; they were then eaten, or placed in a wooden vessel called a "Čuliban," and pounded by a piece of wood into masses or cakes resembling lumps of fat. These were smoked, and kept good for a fairly long period. The first time this diet is partaken of by

Fig. 12.—The Tomato Moth.
(*Heliothris armigera*, Hubn.)

the native tribes, violent sickness is caused; but, after becoming accustomed to it—generally in a few days—they thrive and fatten in a remarkable manner upon it. The quantities of moths that may be collected from one of the granite groups, it is calculated, would amount to at least 5 or 6 bushels. These moths appear in countless millions near Melbourne, at irregular intervals, in the summer evenings after a hot day. When a hot north wind is blowing, they are carried out to sea, and when the tide comes in they can be seen strewn for miles along the beaches at Sandringham, Mordialloc, Frankston, and other parts along the Bay; in fact, they can be shovelled up in places. The remedies recommended for tomato moths will rid gardens of these pests.

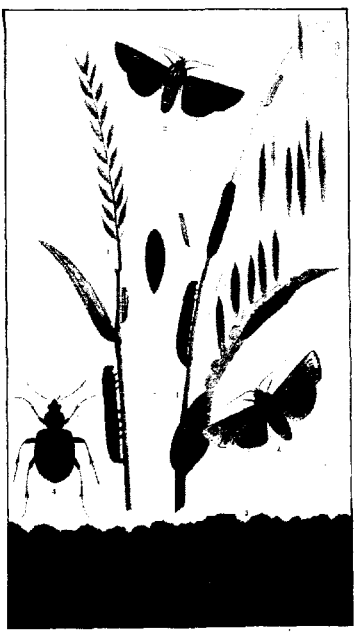


Fig. 13.—Cutworm Moths.
(Mamestra Evingi, and *Agrotis sp.)*

PAINTED APPLE MOTH.

The inroads that many moths, whose natural food plants grow in our bush, are making into the orchards and gardens of Victoria and New South Wales is a subject well worthy of investigation.

The caterpillars of this handsome little moth are very destructive. In its native state, it feeds upon the foliage of a number of different species of wattles, but it is now almost omnivorous in its habits. It has been particularly plentiful recently, and has attacked apples, quinces, plums, also pelargoniums, stocks, bouvardias, and other garden plants. When fully grown, the caterpillars measure about 1 inch in length. They are clothed in long hairs, with two curious appendages projecting from near the tail.

When fully grown, they crawl into any corner, and spin a loose, light-brown, silken cocoon, through which the pupæ can be seen. The male moth measures about an inch across its outspread wings, of which the fore pair are dark-brown, marbled with yellow and grey markings.

The female is much larger, and is wingless; its life is very short for it crawls out of the cocoon, lays its eggs upon the top of it, and dies.

Fig. 14.—The Painted Apple Moths. (*Teia anartoides*, Walk.)

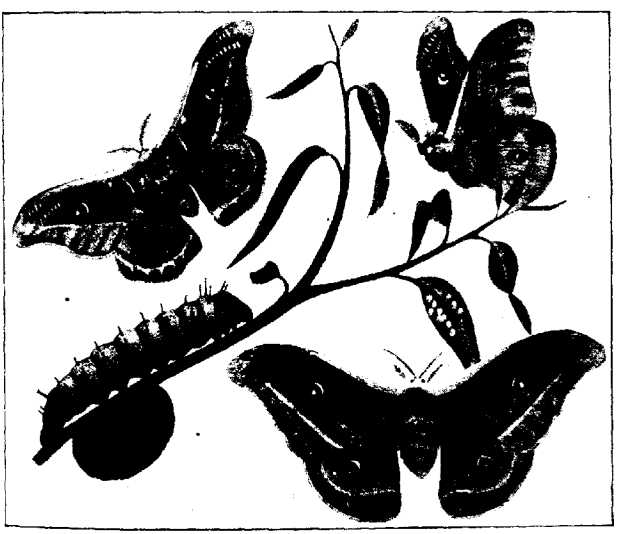


Fig. 15.—Gum Emperor Moth. (*Antherea eucalypti*, Scott.)

Prevention and Remedies.

Hessian bands, similar to those used for codlin moth, have been tried with great success. Spraying the trees with any of the arsenical sprays will also be found of much advantage.

GUM EMPEROR MOTH.

This is one of the finest Victorian moths, and has a wide range over the other States. Its large, beautiful green caterpillars are often to be seen on pepper and eucalyptus trees in our gardens. The eggs, which are like little white or creamy beads, are generally placed on the edges of the leaves, sometimes the edges being lined with them. When hatched, the caterpillars are very dark, almost black-coloured, but by successive moults soon change to the beautiful green tint of the full-grown caterpillars, which has star-like tufts on each segment. The caterpillars often measure 5 inches in length. The cocoons are oval in shape, and measure 1 inch to 1½ inch in length, and are very tough. The moths are of a delicate reddish-fawn colour, but variable in both size and colour, often with a pink tint and four eye-like spots or blotches—two on the upper wings and two on the lower wings. Recently, these caterpillars have attacked apple trees and roses. Spray with any of the arsenical sprays. These insects are often destroyed by ichneumons and other hymenopterous insects, wasps, &c., also by parasitic flies.

(*To be continued.*)

COST OF INSECT PESTS.

"We hardly realize," says an American magazine, "that £50,000,000 a year, about £1,000,000 a week, is spent directly or indirectly in trying to check the ravages of the insect pests that prey on the crops. Besides this the pests eat, according to Government estimates, about £160,000,000 worth of food annually, which brings their cost up to over £200,000,000 a year clear loss. In every State effective war is waged on these pests. Every weapon known to science is employed. But no sooner is a particular pest conquered in one part of the country than it appears in another. Emphasis has been placed in recent years on insect-destroying birds, and these are being protected in all kinds of ways. Laws against the use of bird feathers on hats are part of this protection, and in many States forest areas have been established as bird refuges. Science has also attacked the problem in breeding insects to destroy other insects. The melon aphis, for example, used to cost the growers in one Californian valley £1,000,000 a year. The lady bug, it was found, devoured the aphis. So lady bugs were collected and kept in cold storage. About 2,000 lbs. were gathered in certain canyons in the Sierras, each pound representing about 25,000 bugs. They bred prodigiously. It was found that 50,000 of them would keep 20 acres of melons free of the aphis and other plant lice. As a result, bumper crops have since been raised. So now scientists are studying the problem of bugs to eat bugs, which shall in themselves be harmless to the crop. And thus the battle for the crop goes on yearly, and never before, perhaps, with such success or with such general application."

VICTORIAN RAINFALL.

First Quarter, Year 1916.

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	49	1	5	55
	Normal	55	68	116	239
	Per cent. above normal	..	..	..	..
	„ below „	11	99	96	77
Mallee South	District Mean.. ..	146	19	10	175
	Normal	57	78	100	235
	Per cent. above normal	156	..	..	..
	„ below „	..	76	90	26
North Wimmera ..	District Mean.. ..	100	32	2	134
	Normal	64	70	98	232
	Per cent. above normal	56	..	..	..
	„ below „	..	54	98	42
South Wimmera ..	District Mean.. ..	105	27	1	133
	Normal	93	78	112	283
	Per cent. above normal	13	..	..	..
	„ below „	..	65	99	53
Lower Northern Country	District Mean.. ..	168	62	9	239
	Normal	90	79	118	287
	Per cent. above normal	87	..	..	..
	„ below „	..	22	92	17
Upper Northern Country	District Mean.. ..	163	95	10	268
	Normal	116	96	138	350
	Per cent. above normal	41	..	..	..
	„ below „	..	1	93	23
Lower North-East ..	District Mean.. ..	192	125	74	391
	Normal	154	147	231	532
	Per cent. above normal	25	..	..	..
	„ below „	..	15	68	27
Upper North-East ..	District Mean.. ..	336	235	76	647
	Normal	217	182	284	683
	Per cent. above normal	55	29	..	..
	„ below „	..	..	73	5
East Gippsland ..	District Mean.. ..	291	415	221	927
	Normal	256	217	241	714
	Per cent. above normal	14	91	..	30
	„ below „	..	..	8	..
West Gippsland ..	District Mean.. ..	419	348	124	891
	Normal	229	159	280	668
	Per cent. above normal	83	119	..	33
	„ below „	..	..	56	..

VICTORIAN RAINFALL—*continued.*

District.	——	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
East Central	District Mean.. ..	381	182	67	630
	Normal	233	173	282	688
	Per cent. above normal	64	5	..	..
	„ below „	..	..	76	8
West Central	District Mean.. ..	214	172	28	414
	Normal	146	131	211	488
	Per cent. above normal	47	31	..	..
	„ below „	..	..	87	15
North Central ..	District Mean.. ..	214	118	11	343
	Normal	130	122	180	432
	Per cent. above normal	65	..	..	..
	„ below „	..	3	94	21
Volcanic Plains ..	District Mean ..	217	62	9	288
	Normal	139	117	184	440
	Per cent. above normal	56	..	..	..
	„ below „	..	47	95	35
West Coast	District Mean.. ..	254	87	24	365
	Normal	148	126	209	483
	Per cent. above normal	72	..	..	..
	„ below „	..	31	89	24

N.B.—100 points = 1 inch.

Dry conditions prevailed generally during the first three weeks of January, but the latter end of the month witnessed some very heavy falls, rains of a widespread character falling throughout the State. In the Mallee these rains hindered the harvesting operations, but in the Central, South, and Western Districts their effect was decidedly advantageous with regard to the potatoes, summer fodders, and orchards. With few exceptions, the harvesting results equalled or exceeded anticipations, and in the neighbourhood of Lismore, in the west, the average yields were estimated at 25 bushels per acre; and in parts of the Wimmera, 42 bushels were obtained. All the available stock were in exceedingly good condition owing to the abundance of food, but the general regret of the farmer was that he had insufficient stock to eat down the prolific herbage. In Gippsland the early rains were exceedingly beneficial, and arrived most opportunely, and in time to resurrect the late-sown maize, and also the potato crop.

Very little rain occurred in the Mallee and Wimmera during February, but in the North-East and Gippsland, some heavy falls were experienced, due mostly to monsoonal conditions; and some very heavy thunderstorms, especially in Central and North-East, took place. These rains had a beneficial effect on the maize and potato crops, promoting vigorous growth, and insuring more than a sufficiency

of green grass; but, as stock was exceptionally dear, and the prices fabulous—as much as £20 being demanded for milch cows—the replenishing of the herds and flocks could not be undertaken, except by the financially strong class.

March was a dry month, at some places north of the Divide an entire absence of rain was noticeable. In fact, East Gippslanders were the only ones to benefit during the period; the rains in this part of the State either exceeded or approximated to average conditions. They were the results of thunderstorms, and were highly appreciated, as stock maintained their previous high standard of excellence in condition, and the potato, maize, and other summer crops showed splendid results, and dairying operations were ideal. In the Mallee, the absence of rain in any appreciable quantity during this month, and its predecessor, had a bad effect on the pastures; and in the Wimmera, stock were generally falling off in condition, and water was becoming scarce. Elsewhere, stock were fat, but inland rivers had ceased to flow and the supply of water was diminishing—Gippsland being the exception. Record yields of fruit of exceptionally good quality were being obtained everywhere.

H. A. HUNT,
Commonwealth Meteorologist.

29.4.16.

WALL PAPERS THAT DESTROY LIGHT.

People are constantly asking what is the best colour for wall paper or hangings. The following table will give the fullest particulars. Common wall papers were tested recently in an illuminating laboratory for their light-absorbing qualities, with the following results:—

Wall papers.	Percentage of light absorbed.
White	30
Chrome yellow	38
Orange	50
Plain deal	55
Yellow	60
Light pink	64
Emerald green	82
Dark brown	87
Vermilion	88
Blue-green	88
Cobalt-blue	88
Deep chocolate	96

This table shows that if a room papered with dark green be repapered with chrome yellow, it will be four times as light with the same lamps and windows. In many cases householders pay too much for electricity and gas lighting because their light-absorbing wall coverings destroy the light rays.

BUILDING UP A FLOCK.

Thirteen years ago, when Mr. J. Anderson, of Knysvale, Victoria, was a child, an uncle gave him a Shropshire ewe as a birthday present, and later on lent a Shropshire ram. In due course twin lambs were born. Later on, the original ewe and two ewe lambs dropped more lambs, the boy being indebted again to his uncle for the loan of a ram. A proportionate increase was recorded with each succeeding year, and the youthful stockbreeder had retained a few of his ram lambs. His father then gave him the free use of a paddock of 300 acres. Mr. Anderson remarked to the writer:—"I wanted my boy to stay on the farm, and since he displayed an intelligent interest in his little flock I reckoned that if he could make money out of sheep he would soon realize that he had something better than a billet in the city." He has got something better than "a billet." He made a practice of selling a majority of the ram lambs and breeding from the ewe lambs. To-day his flock of 67 Shropshires is the result of his own breeding. With money originally realized through the sale of Shropshire ram lambs, he purchased crossbreds, since he had the freedom of ample grazing area. Further sales brought in more money, with which he purchased additional sheep. In April last, when his flock comprised about 135 ewes and 7 rams all told, he purchased 55 crossbred ewes. This purchase was made with money banked from sale returns of the character noted. His deal of the past year returned him 7s. per head for wool shorn from sheep that cost him 13s. each last April. The ewes are his property still, and, in addition, he has a complement of lambs. What this extra asset means to-day it is hardly necessary to specify, but given a fair percentage of ewe lambs, this most interesting flock shows every promise of increasing well up to the 500 total before the end of the present year.—*Auckland Weekly News*, 24th February, 1916.

STOCKHOLM TAR.

Now that the season for pruning fruit trees and lopping forest and ornamental trees is approaching, it is an appropriate time to bring under notice the virtues of Stockholm tar as an antiseptic and germ destroyer.

Where a branch is sawn or cut off and the bark trimmed round with a knife, then the tar should be at once applied with a brush or piece of stick. If genuine Stockholm tar, it will be very thick and viscous in cold weather, and should be warmed before application. The whole of the surface of the wound should be covered. This is Listerism applied to vegetation, as the tar prevents unfavorable germs from developing and promotes a healthy growth. In a short time new wood completely covers the wound even when the branch is 6 inches or more through, and a perfect cicatrix results.

Coal tar must *not* be used, as it is destructive and objectionable.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.5.16	15.5.16 to 14.6.16	Total to Date.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
17	W. G. Swift	White Leghorns ..	120	135	255	1
27	John Blacker	,, ..	116	134	250	2
40	A. Brundrett	,, ..	115	132	247	3
7	C. J. Jackson	,, ..	108	137	245	4
13	H. J. Meddows	,, ..	122	118	240	5
36	E. W. Hippe	,, ..	113	127	240	
41	Excelsior Poultry Farm ..	,, ..	108	129	237	7
25	A. H. Mould	,, ..	104	133	237	
11	R. W. Pope	,, ..	121	112	233	9
38	V. Little	,, ..	115	117	232	10
16	F. Collings	,, ..	115	115	230	11
1	G. McDonnell	,, ..	111	118	229	12
37	J. M. Smith	,, ..	103	116	219	13
3	W. M. Bayles	,, ..	110	103	213	14
28	S. Cheatle	A.C.B. Leghorns ..	83	129	212	15
34	F. G. Silbereisen ..	White Leghorns ..	105	105	210	16
26	Mrs. A. Dumas	,, ..	104	101	205	17
24	H. N. H. Mirams ..	,, (5 birds)	79	126	205	
15	G. Laughlan	White Leghorns ..	113	91	204	19
44	J. Jamieson	,, ..	71	133	204	
30	F. T. Denner	,,	79	125	204	
23	T. A. Pettigrove ..	,, ..	93	109	202	22
22	Mrs. H. Stevenson ..	,, ..	83	115	198	23
12	G. Hayman	,, ..	109	87	196	24
10	J. H. Duncan	,, ..	44	143	187	25
18	C. Ludwig	,, ..	103	80	183	26
14	W. B. Hustler	,, ..	65	113	178	27
45	C. H. Oliver	,, ..	83	·93	176	28
32	N. Burston	,, ..	44	124	168	29
5	W. G. Osburne	,, ..	101	61	162	30
20	H. Merrick	,, ..	93	69	162	
6	J. J. West	,, ..	101	·57	158	32
21	A. E. Payne	,, ..	74	79	153	33
42	Thirkell and Smith ..	,, ..	68	76	144	34
19	Benwerren Egg Farm ..	,, ..	65	79	144	
29	A. S. Hyndman ..	,, ..	50	93	143	36
39	L. McLean	,, ..	12	124	136	37
43	S. Buscumb	,, ..	70	50	120	38
8	E. A. Lawson	,, ..	52	66	118	39
101	A. E. Silbereisen ..	,, ..	15	91	106	40
33	E. F. Evans	,, ..	54	37	91	41
9	W. H. Clingin	,, ..	59	12	71	42
35	Tom Fisher	,, ..	5	64	69	43
31	J. H. Gill	,, ..	32	26	58	44
4	Fulham Park	,, ..	5	31	36	45
		Total ..	3,695	4,415	8,110	
		HEAVY BREEDS.				
		DRY MASH.				
98	Marville Poultry Farm ..	Black Orpingtons ..	78	157	235	1
97	D. Fisher	,, ..	95	128	223	2
100	Oaklands Poultry Farm ..	,, ..	68	132	200	3
94	Mrs. Coad	,, ..	30	130	160	4
95	T. W. Pearce	,, ..	70	61	131	5
99	J. Ogden	,, ..	3	39	42	6
96	H. Hunt	,, ..	..	18	18	7
		Total ..	344	665	1,009	

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.5.16.	15.5.16 to 14.6.16	Total to Date.	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
46	W. H. Robbins ..	White Leghorns ..	140	134	274	1
59	T. A. Pettigrove ..	,, ..	134	139	273	2
61	C. C. Dunn	,, ..	128	130	258	3
52	W. J. Thom	,, ..	128	127	255	4
54	Mrs. Hughes	,, ..	108	141	249	5
53	W. N. O'Mullane ..	,, ..	115	129	244	6
58	C. Ludwig	,, ..	105	137	242	7
65	Izard and Tierney ..	,, ..	119	122	241	8
56	Mrs. Nicoll	,, ..	104	136	240	9
62	J. W. Morrow	,, ..	103	126	229	10
70	G. Wilkinson	,, ..	113	112	225	11
64	A. Bennett	,, ..	110	83	193	12
48	Thirkell and Smith ..	,, ..	95	97	192	13
55	Rev. J. Mayo	,, ..	119	62	181	14
47	H. McKenzie and Son ..	,, ..	83	93	176	15
60	A. Greenhalgh ..	,, ..	77	98	175	16
49	C. Lane	,, ..	81	85	166	17
69	E. A. Lawson	,, ..	91	61	152	18
57	H. J. Brown	,, (5 birds)	46	105	151	19
67	Lysbeth Poultry Farm ..	,, ..	60	87	147	20
51	Reliable Poultry Farm ..	,, ..	80	60	140	21
50	Clevedon Poultry Farm ..	,, ..	57	69	126	22
66	Benwerrien Egg Farm ..	,, ..	15	49	64	23
68	W. G. Osburne	,, ..	20	43	63	24
63	N. Burston	,, ..	..	56	56	25
		Total ..	2,231	2,481	4,712	
		HEAVY BREEDS.				
		WET MASH.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	140	154	294	1
89	Brooklyn Poultry Farm ..	,, ..	136	150	286	2
72	Marville Poultry Farm ..	,, ..	141	119	260	3
87	S. Buscumb	,, ..	119	119	238	4
86	C. Ludwig	,, ..	118	117	235	5
80	Mrs. Pearce	,, ..	104	109	213	6
79	Stranks Bros.	White Orpingtons ..	90	116	206	7
85	Mrs. M. Coad	Black Orpingtons ..	91	109	200	8
88	A. D. McLean	,, ..	60	138	198	9
83	L. McLean	,, ..	69	128	197	10
92	J. H. Wright	,, ..	60	135	195	11
93	L. W. Parker	,, ..	49	146	195	11
81	K. Courtenay	Faverolles ..	87	98	185	13
77	Mrs. G. R. Bald ..	White Plymouth Rocks ..	56	91	147	14
90	Excelsior Poultry Farm ..	Black Orpingtons ..	40	92	132	15
78	Reliable Poultry Farm ..	,, ..	33	98	131	16
91	N. Papayanni	,, ..	36	70	106	17
73	E. W. Hippe	Rhode Island Reds ..	40	64	104	18
84	H. L. Trevana	,, ..	30	49	79	19
76	L. A. Errey	Silver Wyandottes ..	18	33	51	20
75	Mrs. Drake	Rhode Island Reds ..	32	18	50	21
71	C. E. Graham	Black Orpingtons ..	..	40	40	22
82	J. Ogden	,, ..	3	1	4	23
		Total ..	1,552	2,194	3,746	

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

BURNLEY REPORT.

A week of heavy frosts was a feature of the weather this month. Temperature as low as 23 F. was registered 2 feet above ground, and 28 F. in houses.

Frozen water pipes were the chief trouble experienced. Notwithstanding adverse conditions the birds have done really well, the dry mash light breeds and heavy breeds wet section especially so. The number of partial moulters is not so large as last year, and broodies are also less. Temperature—lowest, 28 F.; highest, 66 F. Rainfall, 208 points.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal School of Horticulture, Burnley.

The Orchard.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive storm-water; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other materials.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

SPRAYING.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying with lime sulphur will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray, too, is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lasiandra, Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

Live Stock.

HORSES.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed in the day-time when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Calves should be kept in warm, dry shed. Those on the bucket should be given their milk warm. Look out for milk fever and treat as recommended in *Year Book of Agriculture*, 1905.

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry, and the feeding troughs clean and wholesome. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run.

SHEEP.—Decide on the breed and number of rams required for the coming season. Place orders as soon as possible, for breeders can then give better satisfaction and allot preference to the earlier applications. The result of mating should be given most careful consideration from a wool point of view. Evidence points to an extreme shortage of good merino and fine cross-bred wool for years to come. At the same time, a steadily increasing demand has set in for materials manufactured from these finer grades. The world's civilian requirements must be met, and for flannels and finer materials for temperate and cold climates these are indispensable. After all coarse wools have a limited use. Cull stud ewes carefully, especially merinoes, consider form as well as evenness of covering and style of wool. Discard for thin fribby forearms, for coarse common thighs, for mushy wasty undercovering, inferior patches across the shoulders, common and short between the hip bones. Individual merit must be considered carefully, pedigree alone is not sufficient.

POULTRY.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

Cultivation.

FARM.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

ORCHARD.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur spray.

FLOWER GARDEN.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

VEGETABLE GARDEN.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

VINEYARD.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply 1st acid iron sulphate treatment (see *Journal for July*, 1911).

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.